THE

AMERICAN GAS-LIGHT JOURNAL.

THE OFFICIAL GAZETTE OF

LIGHT, HEAT, WATER-SUPPLY, AND SEWERAGE.

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THE MAGNESIUM LIGHT.

We have, on several occasions, drawn attention to the metal magnesium, and have expressed a hope that some day it could be obtained in sufficient quantity, and at a sufficiently low price to render it available for the uses of the photographer. The wonderfully brilliant light which is produced by its combustion, the absolute innocuousness of the evolved products, and the ease with which the light can be obtained at any time, with no more trouble than is required to light a candle, all tend to show that the perfection of artificial photographic light would result from the burning of this metal in a properly arranged lamp. Many attempts have been made, with varying degrees of success, to introduce an artificial light sufficiently powerful to enable photographs to be taken by its means at night, or in dark caverns, where no photography would otherwise be possible; and, in many cases, fair success has been met with. The light evolved by all such pyrotechnic mixtures is, however, very feeble, as compared with sunlight, unless an inordinate amount of material be employed; and, in this case, the fumes evolved are difficult to remove readily from the place where the light is produced; but unless they are perfectly removed their poisonous character make them very dangerous. The magnesium light would be superior in both these respects. A thin wire simply held between the fingers, can be lit as easily as a piece of paper, and burns like a candle; producing a light which is, according to Bunsen's estimate, only about thirteen times less intense than actual sunlight. No injurious fume is evolved during the combustion. A light white smoke is seen rising from the metallic flame; but this is nothing but magnesia, and is quite harmless. Moreover, the greater portion of the magnesia remains behind, as a friable solid, retaining somewhat the shape of the original wire.

We believe an arrangement of lamp for the magnesium light has already been devised. A spool of wire is gradually unwound, the end being pushed horizontally into the flame of a spirt lamp, where it ignites and continues to burn as long as it is fed with wire. It is in this feeding that the great difficulty has resided. Although it has long been well known—thanks to the labors of Deville and Caron—that magnesium could be procured even easier and at a less price than aluminum, by a slight and obvious modification of the apparatus used to prepare the latter metal, no one cared about risking the necessary outlay requisite to procure the metal in large quantities, when there was a doubt as to whether there would ever be sufficient demand to make the manufacture pay. In the *Comptes Rendus* for Feb. 23, 1857, Messrs. Deville and Caron give a detailed paper on the preparation of magnesium, in which they say that it can be prepared by the process employed for aluminum, which, however, must be slightly modified, as magnesium is lighter than the scoria from which it is produced. A mixture of chloride of magnesium, chloride of sodium, and fluoride of calcium is made, and finely powdered. Sodium, in fragments, is then added and intimately mixed with the chlorides, and the whole is thrown, by means of a little iron spatula, into a red-hot earthen crucible, which is then closed with its cover. In a short time the reaction takes place. When all noise has ceased, the crucible is uncovered, and the mixture is stirred with an iron rod until the globules of magnesium are distinctly seen. The crucible is then allowed to cool, and when the saline mass is ready to solidify, it is again stirred with the iron rod, which collects the separate lumps of magnesium into one mass. The metal is then distilled in a current of hydrogen, and then fused in a flux composed of chloride of magnesium, chloride of sodium, and fluoride of calcium. The latter is added to increase the fusibility of the bath.

Messrs. Deville and Caron still worked at the subject, and more recently gave an improved process for the preparation of the metal, in which they recommend the omission of the alkaline chloride, and only use chloride of magnesium mixed with fluoride of calcium for the reduction by sodium, although they state that good results were also obtained by using a mixture of chlorides of magnesium and sodium. They give improved methods of separating the metal from the flux, and for melting and casting it into an ingot. Respecting the properties of magnesium, they describe it as a silver white metal melting at about the same temperature as zinc, and like it boiling and distilling at a higher temperature. Like zinc it also takes fire and burns at a temperature a little above its melting point. The density of magnesium is 1.75. In the crude state it is brittle, but by distillation it is rendered pure and ductile.—*Photographic News.*

THE ELECTRIC LIGHT IN BOSTON.

The following letter on the electric light appears in the Boston *Daily Advertiser:*

Through the kindness of Mr. Ritchie, whose repetition of the electric light on Thursday evening was so interesting and splendid, I was enabled to make a more satisfactory measurement of the illuminating power of the battery at the State House than I had the means of doing on the occasion of its former exhibition on the 4th of July. As the results of the observation then made were published in your paper, it may perhaps interest some of your readers to have a statement of these later confirmatory and more accurate measurements. The battery in question, consisting of 250 Bunsen pairs of the largest size commonly used, was arranged in the dome of the State House, and the carbon light and the photometric apparatus prepared for the purpose were placed in line across the same apartment, commanding a range of about fifty feet In view of the immense power of the light, as observed in the previous experiment I substituted for the 20 candle gas-burner, used at that time as the standard of comparison, a unit ten times as great, formed by the flame of a kerosene lamp placed in the focus of a small parabolic reflector, and throwing its concentrated light on a photometric screen of prepared paper fixed in front of it, at the distance of five feet. Before the observation, the lamp and reflector were so adjusted as to make the light cast on the near side of the screen equivalent by measure to the action of 200 candles.

A platform supporting the standard lamp and screen at the assigned distance was arranged to slide on a horizontal graduated bar, extending directly toward the carbon points, so that the screen should receive the rays from the electric light, and from the reflector perpendicularly on its opposite faces. In making the observations the platform was moved to and fro until the illumination on the opposite sides of the screen was judged to be equal, and then the measured distances of the two antagonizing lights from the screen gave by easy computation their relative illuminating power.

By a series of such observations it was found that the carbon light had a force bearing from 52 to 61 times that of the lamp with reflector, making it equivalent in illuminating power to the action of from 10,000 to 12,000 standard sperm candles pouring their light from the same distance upon the surface of the screen. This it will be remembered, is the effect of the unaided carbon light sending its rays equally in all directions from the luminous centre, and falls vastly short of the illuminating force of the cone of collected rays which was seen stretching like the tail of a comet from the surface of the great reflector. Judging from some recent experiments on the power of such a reflector to augment the intensity of the light emanoting from its focus, there can be no doubt that along the axes of the cone, when brought to its narrowest limits, the illuminating force of the carbon light as displayed on the State House could be rivaled only by that of several millions of candles shining unitedly along the same line.

In concluding this brief notice of experiments and results, which are not without scientific as well as popular interest, allow me to express the satisfaction which all must feel in the thought that our city has been the first in this country, and, perhaps, regarding the magnitude and success of the experiment, the first in the world to make the splendors and the wonders of the electric light a familiar public entertainment as well as a chosen illustration of patriotic feeling.

The *Journal* of the same city also refers to the subject, and says: "A correspondent informs us that the electric light was seen from Monadnock mountain, in Jaffrey, N. H., which is about eighty miles from Boston by road. The effect is thus described: 'The night was not favorable for observation from the mountain, as there was a heavy mist on and around it, and some fog; still we saw the light *very distinctly*, and at two or three times it seemed to have a peculiar brilliancy, throwing jets of light up until they were lost in a dark cloud, which seemed to hang between us and the light. Whether those jets were occasioned by the motion or revolution of the light, or by the sudden shifting of the very heavy mist or fog by the strong wind which was blowing at the time, we could not tell.'"

PRESENTATION TO THE LESSEE OF A GAS-WORKS.—A few weeks ago the workmen connected with the Portsea Gas-Works, in England, presented to Mr. J. A. Methven, the lessee of the works, a handsome silver tobacco jar, as a testimonial of their esteem for their employer. The gift was presented by the clerk of the works, who made a suitable address, which was responded to by Mr. Methven in appropriate terms. The jar bore the following description: "Presented to J. A. Methven, Esq., by his workmen, in appreciation of his kindness during the time of his lease of the Portsea Island Gas-Works, June 30th, 1863."

SELF-SELECTED BUT NON-ELECTED.—At a quarterly meeting of the Town Council of Burnley, England, held July 1st, the gas committee reported that there had been seventy-three applications for the office of gas manager. As but one of these individuals could be chosen for the position the number of disappointed candidates was quite large.

WATER SUPPLY FOR ABERDEEN, SCOTLAND.—New plans have just been prepared by Mr. Simpson, C. E., for supplying Aberdeen with water. The existing supply is obtained by pumping from the river Dee; the quantity being 1,200,000 gallons per day. An aqueduct will now bring the water from the river, twenty miles from the city, and the supply will be raised to 5,000,000 gallons.

GAS-LIGHT COMPANIES IN THE UNITED STATES.

Compiled from official sources expressly for the AMERICAN GAS-LIGHT JOURNAL.

CORRECTED BY JOHN B. MURRAY, No. 39 NASSAU STREET, NEW YORK, DEALER IN GAS-LIGHT SHARES.

When Chartered.	Town.	State.	Chartered Capital.	Par Val. Per Sh $	Semi-Ann'l Div'd.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
1857	ADRIAN	Mich.	50,000	50	—	May & November.	4,000	3 50	....	...	
1856	AKRON	O.	20,000	33⅓	—	Do.	3,500	3 00	...	...	
1845	ALBANY	N. Y.	25,000	20	4	January & July.	65,000	3 00	120	....	None in market.
1858	ALBION	N. Y.	30,000	100	—	Do.	3,000	3 80	....	....	
1851	ALEXANDRIA	Va.	106,380	—	—	City Works.	9,000	3 50	....	....	
1852	ALLEGHANY	Pa.	200,000	25	4	May & November.	25,000	3 00	....	....	
1853	ALLENTOWN	Pa.	60,000	100	2½	Do.	5,000	3 50	....	....	
1857	ALTON	Ill.	75,000	—	—	Private Works.	4,000	3 50	....	....	
1850	ALTOONA	Pa.	40,000	20	4	January & July.	5,000	3 00	....	...	
1859	AMESBURY AND SALISBURY	Mass.	30,000	25	—	Do.	7,000	4 00	....	....	
1858	ANNAPOLIS	Md.	100,000	25	—	Do.	4,000	4 00	....	....	
1858	ANN ARBOR	Mich.	23,000	50	5	March & September.	5,500	4 00	....	....	
1858	ASTORIA	N. Y.	20,000	50	—	Do.	6,000	4 00	....	....	
1855	ATLANTA	Ga.	50,000	25	5	January & July.	12,000	5 00	....	....	
1857	ATTLEBORO'	Mass.	6,000	50	3	Do.	2,000	6 00	....	....	
1850	AUBURN	N. Y.	80,000	50	5	Do.	10,000	7 00	....	....	
1851	AUGUSTA	Ga.	80,000	25	8	Do.	9,000	6 00	....	....	
1853	AUGUSTA AND HALLOWELL	Me.	84,700	50	5	Do.	10,000	4 00	....	....	
1860	AURORA	Ind.	10,000	—	—	Private Works.	3 500	3 50	....	....	{ Formerly used Sanders' Water-Gas. Recently altered to Coal Gas-Works. None for sale.
1817	BALTIMORE	Md.	550,000	100	5	June & December.	150,000	2 50	150	....	
1852	BANGOR	Me.	120,000	100	4	January & July.	12,000	3 50	....	....	
1855	BATAVIA	N. Y.	32,000	20	4	Do.	2,500	4 00	....	....	
1858	BATH	Me.	65,000	100	3	April & October.	10,000	3 75	...	...	
1859	BATH	N. Y.	115,000	50	—	May & November.	3,000	7 00	....	....	
1861	BATTLE CREEK	Mich.	15,000	—	—	January & July.			....	....	
1858	BELFAST	Me.	14,000	100	—	Do.	7,000	7 00	....	....	
1856	BELLEFONTE	Pa.	20,000	25	2	Do.	8,500	4 00	....	....	
	BELOIT	Wis.	30,000	—	—	Do.	4,000	4 00	....	....	
1854	BETHLEHEM	Pa.	50,000	50	4	June & December.	2,000	3 20	...	....	
1859	BEVERLY	Mass.	40,000	100	—	January & July.	4,000	4 00	....	....	
1858	BINGHAMPTON	N. Y.	50,000	50	3½	Do.	10 000	4 00	....	....	
1859	BIRMINGHAM	Pa.	40,000	50	—	Do.	4,000	4 00	....	....	
1855	BLOOMINGTON	Ill.	40,000	50	—	Do.	6,000	4 00	...	....	
1858	BORDENTOWN	N. J.	50,000	25	3	June & December.	4,000	3 80	....	....	
1822	BOSTON	Mass.	1,000,000	500	5	Do.	130,000	2 25	....	....	
1859	BRATTLEBORO'	Vt.	21 000	—	—	Do.	3,000	4 00	....	....	
1851	BRIDGEPORT	Ct.	90,000	25	4	January & July.	10,000	4 00	90	....	Passed last dividend.
1857	BRIDGETON	N. J.	50,000	20	—	Do.	5,000	4 00	....	....	
1856	BRISTOL	Pa.	30,000	25	3	February & August.	3,000	4 00	....	....	
1855	BRISTOL	R. I.	35,000	50	2	January & July.	6,000	4 00	....	....	
1859	BROCKPORT	N. Y.	25,000	100	3	Do.	1,500	4 00	....	....	
1858	BROOKLINE	Mass.	66,000	100	3½	February & August.	8,500	3 50	....	....	
1825	BROOKLYN	N. Y.	2,000,000	25	5	January & July.	75,000	2 50	170	160	
	BROWNSVILLE	Pa.				Do.			....	....	
1848	BUFFALO	N. Y.	600,000	50	5	Do.	70,000	2 90	140	125	
1852	BURLINGTON	N. J.	100 000	25	3½	Do.	5,000	4 00	105	....	
1853	BURLINGTON	Vt.	75,000	25	2½	Do.	10,000	4 50	....	....	
1839	FURLINGTON	Iowa.	65,000	50	—	Do.	8,000	4 00	....	....	
1861	CALAIS	Me.	90,000	100	—	Do.	10,000	3 50	....	....	
1852	CAMBRIDGE	Mass.	300,000	100	5	February & August.	20,000	3 50	100	97½	
1852	CAMDEN	N. J.	300,000	100	3	April & October.	15,000	3 50	105	100	
1853	CANANDAIGUA	N. Y.	50,000	50	—	January & July.	3,000	4 00	90	80	
1850	CANTON	O.	19,0 0	50	6	March & September.	6,000	3 00	....	....	
1853	CAPE ISLAND	N. J.	80,000	100	—	October.	10,000	6 00	....	...	{ Watering place.—These Works only run in summer.
1860	CARBONDALE	Pa.	16,000	25	—	March & September.	5,000	4 00	....	....	
1855	CARLISLE	Pa.	30,000	25	—	January & July.	4,000	4 00	....	...	
1856	CATASAUQUA	Pa.	15,000	25	5	May & November.	2,000	4 00	....	....	
1858	CATSKILL	N. Y.	—	—	—	Private Works.	3,000	3 00	....	....	Owned by G. T. Sutton.
1857	CHAMBERSBURG	Pa.	30,000	25	—	January & July.	3,000	4 00	....	....	
1846	CHARLESTON	S. C.	723,800	25	4	Do.	50,000	4 00	....	....	
1851	CHARLESTOWN	Mass.	200,000	50	4	Do.	30,000	3,00	105	...	
1858	CHARLOTTE	N. C.	14,000	50	10	March & September.	3,500	6 00	....	....	
1859	CHARLOTTESVILLE	Vt.	15,000	25	—	Do.	4,000	4 50	....	...	
1851	CHELSEA	Mass.	100 000	100	3½	January & July.	8,000	3 50	....	....	
1856	CHESTER	Pa.	25,000	25	3	April & October.	4,000	4 00	....	....	
1849	CHICAGO	Ill.	1,300,000	25	5	January & July.	100,000	2 50	150	140	Very scarce. Stock wanted.
1857	CHICOPEE	Mass.	50,000	20	—	Do.		4 00	....	....	
1851	CHILLICOTHE	O.	40,000	25	4	Do.	12,000	3 50	....	....	
1841	CINCINNATI	O.	1,600,000	100	5	Do.	225,000	2 50	....	....	
1859	CITIZENS', BROOKLYN	N. Y.	1,000,000	20	—	Do.	135,000	2 00	128	125	
1860	CITIZENS', READING	Mass.	30,000	100	—				....	....	
	CLARKESVILLE	Tenn.	100,000	50	—	Do.	5,000	4 00	....	....	
1860	CLAREMONT	N. H.	20 000	100	—	March & September.	3,000	4 00	....	....	
1846	CLEVELAND	O.	200,000	10	5	January & July.	20,000	3 00	....	....	
1858	CLINTON	Mass.	30,000	500	5	Do.	3,000	4 00	....	...	
1859	CLYDE	N. Y.	10,000	50	4	Do.	2,500	4 00	...	....	
1854	COHOES	N. Y.	50,000	20	3½	April & October.	5,000	3 60	....	....	
1860	COLD SPRING	N. Y.	30,000	50	—	Do.	3,500	4 00	80	....	{ Formerly Rosin-Gas, but now Coal. A well managed company. Stock firmly held.
1860	COLD WATER	Mich.	25,000	50	5	January & July.	4,000	4 00	....	....	
1852	COLUMBIA	Pa.	87,500	25	—	Do.	4,000	3 50	....	....	
1852	COLUMBIA	S. C.	44,000	25	4	Do.	6,000	6 00	....	....	
1857	COLUMBIA	Cal.	50,000	25	—	Do.	4,500	10 00	....	....	
1858	COLUMBUS	Ga	54,000	25	5	Do.	5,000	7 00	....	....	
1850	COLUMBUS	O.	100,0 0	10	6	Do.	30,000	3 00	....	....	
1853	CONCORD	N. H.	50 000	50	5	Do.	8,000	3 50	....	....	
1-58	COVINGTON AND NEWPORT	Ky.	100,000	50	3½	Do.	28,000	4 00	..	....	
1854	CUMBERLAND	Md.	60,000	50	3	Do.	6,000	4 00	....	....	
1857	DANBURY	Ct.	50,000	25	4	Do.	2,000	3 75	....	...	
1856	DANVILLE	Pa.	30,000	25	—	June & December.	3,000	4 00	....	....	
1855	DAVENPORT	Iowa.	56,000	100	—	Do.	6,000	5 00	....	....	
1848	DAYTON	O.	50,000	25	5	February & August.	8,000	3 50	....	....	
1858	DEDHAM	Mass.	40 000	50	—	January & July.	3,000	4 00	....	....	
1860	DELAWARE	O.	30,000	25	—	Do.	2,500	3 00	....	....	
1849	DETROIT	Mich.	500,000	50	5	Do.	30,000	3 50	160	150	Excellent Stock. No sales.
1860	DOBBS' FERRY	N. Y.	25,000	—	—	Do.	3,000	4 00	....	....	
1854	DORCHESTER	Mass.	150,000	100	—	Do.	14,000	4 00	....	....	
1850	DOVER	Del.	12,000	—	—	Private Works.	2,000	4 00	....	....	
	DOVER	N. H.				January & July.			....	....	
1857	DOYLESTOWN	Pa.	50,000	—	—	Do.	3 000	4 00	...	....	
1854	DUBUQUE	Iowa.	100,000	50	—	Do.	17,000	4 50	....	....	
1833	EAST BOSTON	Mass.	133,000	25	4	Do.	20,000	3 50	....	145	No transactions.
1858	EAST GREENWICH	R. I.	11,200	100	15	Do.	3,000	7 00	....	...	
1861	EAST HAMPTON	Mass.	10,000	25	—	Do.	5,000	9 00	....	....	
1861	EAST NEW YORK	N. Y.	50,000	50	—	Do.	12,000	3 50	....	....	
1857	EASTON	Md.	9,000	10	—	Do.	1,500	7 00	....	....	
1850	EASTON	Pa.	125,000	50	4	June & December.	6,000	3 60	....	....	
1856	EASTPORT	Me.	50,000	55	—	Do.	3,000	4 00	....	....	
1855	ELIZABETH	N. J.	100,000	20	4	January & July.	14,000	3 50	....	....	
	ELLICOTT'S MILLS	Md.	10,000	—	—	Do.	4,000	4 00	....	....	
1852	ELMIRA	N. Y.	50,000	25	3½	Do.	5,000	4 00	....	...	
1852	ERIE	Pa.	68,000	50	3½	June & December.	10,000	3 00	....	....	
1833	EVANSVILLE	Ind.	60,000	50	4	January & July.	12,000	4 00	110	....	A very good Company.
	EXETER	N. H.	60,000	—	—	Do.	12,000		...	...	
	FAIR HAVEN	Ct.	20,000	25		Do.	8,000	4 00	....	....	
1847	FALL RIVER	Mass.	26,000	—	—	Private Works.	12,000	3 50	....	....	
1859	FAYETTEVILLE	N. C.	25,000	100	6	January & July.	7,000	6 00	....	....	
	FIFTH WARD (Milwaukee)	Wis.	50,000	25	—	Do.	10,000	4 00	....	...	
1857	FISHKILL	N. Y.	10,000	20	—	April & October.	1,500	9 00	....	....	
1858	FITCHBURG	Mass.	100,000	50	3	January & July.	5,000	4 00	....	....	Make Petroleum-Gas.
1859	FLEMINGTON	N. J.	20,000	—	—	Do.	3,000	4 00	...	....	
1855	FLUSHING	N. Y.	40,000	50	1½	March & September.	6,500	4 00		....	
1858	FORT WAYNE	Ind.	50,000	25	—	Do.	6,000	4 00	...	....	
1851	FRANKFORT	Ky.	30,000	—	—	City Works.	5,500	4 50	...	...	
1851	FREDERICK CITY	Md.	36,000	100	—	January & July.	5,000	6 70	....	....	
1854	FREDERICKSBURG	Va.	72,500	50	5	Do.	4,500	4 00	....	....	
1858	FREDONIA (Natural Gas)	N. Y.	10,000	100	—	Do.	2,000	4 00	....	....	Unlimited supply of Natural Gas.
1856	FREEPORT	Ill.	20,000	100	—	May & November.	10,000	4 00	....	....	

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When Chartered.	Town.	State.	Chartered Capital.	Par Val. Per Sh. $	Semi-Ann'l Div'd.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
1859	Fremont	O.	25,000	25	—	May & November.	2,000	4 50	....	....	
1858	Fulton	N. Y.	12,000	100	—	Do.	4,000	7 00	....	....	
1855	Galena	Ill.	70,000	100	—	Do.	8,000	4 00	....	....	
1859	Galion	O.	25,000	25	—	January & July.	1,800	3 00	....	....	
1858	Galveston	Texas.	150,000	50	—	May & November.	7,000	6 00	....	....	
1854	Gardiner	Me.	100,000	50	4	Do.	8,000	4 00	....	....	
1853	Geneva	N. Y.	75,000	25	2½	Do.	6,000	4 00	....	....	
1851	Germantown	Pa.	Merged	into	the	Philadelphia Works.	12,000	2 25	....	....	
1859	Gettysburg	Pa.	20,000	50	3	January & July.	2,500	4 00	....	....	
1854	Glen's Falls	N. Y.	35,000	50	3	February & August.	4,000	4 00	....	....	
1854	Gloucester	Mass.	40,000	50	—	January & July.	5,000	3 50	....	....	
1857	Gloversville	N. Y.	15,000	25	—	Do.	3,000	3 50	....	....	
1858	Grand Rapids	Mich.	50,000	20	—	Do.	3,000	4 00	....	....	
1855	Great Barrington	Mass.	5,000	100	5	April & October.	2,000	7 00	....	....	
1849	Great Falls	N. H.	50,000	100	3	Do.	3,000	4 00	....	....	
1860	Greenfield	Mass.	20,000	50	2	January & July.	2,500	4 00	....	....	Close corporation.
1853	Greenpoint	N. Y.	100,000	50	5	Do.	20,000	3 00	....	....	
1859	Greensboro'	N. C.	12,000	50	—	April & October.	3,000	7 00	....	....	
1858	Greensburg	Pa.	80,000	25	3	May & November.	2,000	8 00	....	....	
1854	Hagerstown	Md.	15,000	20	—	January & July.	2,000	6 00	....	....	
	Hamilton	O.	15,000			Do.			....	....	
1850	Hannibal	Mo.	100,000	100	—	Do.	6,000	3 50	....	....	
1857	Harlem	N. Y.	350,000	50	3½	Do.	25,000	3 00	....	145	
1855	Harrisburg	Pa.	100,000	—	4	Do.	5,000	4 00	....	....	
1849	Hartford	Ct.	200,000	25	4	Do.	25,000	3 00	150	140	Stock in demand.
	Hastings	N. Y.				Do.	8,000	4 00	....	....	
1858	Haverhill	Mass.	50,000	50	—	Do.	5,000	4 00	....	....	
1859	Haverstraw	N. Y.	20,000	100	—	Do.	5,000	4 00	....	....	
1861	Hayesville	Mass.	15,000	25		Do.	4,000	4 00	....	....	
1859	Hempstead	N. Y.	16,000	25	—	Do.	1,000	4 00	....	....	
1862	Hoboken	N. J.	100,000	25	3	Do.	30,000	2 50	....	100	Works not yet built.
1856	Hollidaysburg	Pa.	30,000	25	2	Do.	4,000	3 50	....	....	
1861	Holyoke	Mass.	20,000	25	—	Do.	3,000	4 00	....	....	
1861	Homer & Cortlandt	N. Y.	40,000	100	—	Do.	6,000	4 00	....	....	
1854	Honesdale	Pa.	30,000	25	3	Do.	2,500	4 00	....	....	
1860	Hornellsville	N. Y.	12,000	50	—	Do.	2,000	4 00	....	....	
1858	Hudson	N. Y.	50,000	100	3½	February & August.	3,000	4 00	....	....	
	Hunter's Point	N. Y.									
1857	Huntington	Pa.	18,000	50	3	Do.	2,000	3 50	....	....	
1856	Huntsville	Ala.	7,325	25	—	June & December.	2,000	5 00	....	....	
	Indianapolis	Ind.	150,000	—	—	Do.	15,000	5 00	....	....	
1857	Iowa City	Iowa.	40,000	50	—	February & August.	4,000	4 50	....	....	
1852	Ithaca	N. Y.	75,000	25	3½	January & July.	6,000	4 00	....	....	
1857	Jackson	Mich.	25,000	50	5	Do.	6,000	3 50	....	....	
	Jackson	Miss.	80,000	50	—	Do.	4,000	4 50	....	....	
	Jackson	Cal.	50,000	30	—	Do.	4,000	10 00	....	....	
	Jacksonville	Flor.	30,000	20	—	Do.	2,000	7 00	....	....	
1858	Jacksonville	Ind.	50,000	50	—	Do.	4,000	5 00	....	....	
1856	Jacksonville	Mo.	25,000	25	—	Do.	7,000	6 00	....	....	
1853	Jamaica	N. Y.	20,000	—	4	Do.	6,000	4 00	....	....	
	Jamaica Plain	Mass.	75,000	100	3½	Do.	3,000	3 50	....	....	
1856	Jamestown	N. Y.	25,000	—	—	Do.	4,000	4 00	....	....	
	Janesville	Wis.	50,000	100	—	Do.	12,000	4 00	....	....	
1858	Jeffersonville	Md.	30,000	25		Do.	4,000	4 00	....	....	
1858	Jersey City	N. J.	300,000	—	5	Do.	80,000	3 00	150	....	No sales since formation of Hoboken Co.
1856	Jersey Shore	Pa.	15,000	25	—	Do.	2,000	3 70	....	....	
1857	Johnstown	Pa.	80,000	25	3	Do.	8,000	3 00	....	....	
	Joliet	Ill	300,000	100	—	June & December.	6,000	4 00	....	....	
1858	Kalamazoo	Mich.	30,000	50	5	Do.	10,000	4 00	....	....	
1860	Keene	N. H.	60,000	100	—	Do.	4,500	4 00	....	....	
1855	Keokuk	Iowa.	100,000	100	—	January & July.	10,000	4 50	....	....	
1855	Kingston	Pa.	50,000	50	—	Do.	3,000	4 00	....	....	
1859	Kittanning	Pa.	20,000	—	—	Doubtful.	5,000	4 00	....	....	
1854	Knoxville	Tenn.	63,000	—	—	April & October.	4,000	5 00	....	....	Said to be a fraud.
1860	Laconia	N. H.	20,000	100	—	Do.	4,000	6 00	....	....	
1859	La Crosse City	Wis.	100,000	50	—	June & December.	10,000	5 00	....	....	
1854	Lafayette	Ind.	60,000	50	4	January & July.	10,000	3 25	....	....	
1856	Lambertville	N. J.	30,000	25	—	Do.	2,600	4 00	....	....	
1849	Lancaster	Pa.	100,000	50	4	Do.	10,000	3 00	....	....	
1856	Lancaster	O.	25,000	100	5	Do.	5,000	3 50	....	....	
1855	Lansinburg	N. Y.	25,000	100	—	Private Works.	7,000	4 00	....	....	
1849	Lawrence	Mass.	200,000	100	4	February & August.	15,000	3 50	....	....	
1859	Leavenworth	Kansas.	200,000	25	—	January & July.	10,000	5 00	....	....	
1856	Lebanon	Pa.	26,000	50	—	February & August.	5,000	4 00	....	....	
1861	Le Roy	N. Y.	25,000	50	—	Do.	4,000	4 00	....	....	
1858	Lewisburg	Pa.	20,000	100	—	January & July.	4,000	4 00	....	....	
1852	Lewiston	Me.	100,000	100	3	Do	10,000	3 20	....	....	
1856	Lewistown	Pa.	80,000	50	3	April & October.	3,000	3 10	....	....	
1858	Lexington	Ky.	100,000	25	4	January & July.	5,000	4 00	....	....	
1858	Little Falls	N. Y.	112,000	25	—	Do.	3,500	7 00	....	....	
1861	Little Rock	Ark.	20,000	—	—	Do.	5,000	6 00	....	....	
1858	Lockhaven	Pa.	28,000	—	—	Do.	3,000	4 00	....	....	
	Lockport	N. Y.	100,000	50	—	Do.	4,000	4 00	....	....	
1839	Louisville	Ky.	600,000	50	6	Do.	80,000	2 50	125	....	But $481,400 stock has been sold. This Company has a large contingent fund and undivided profit on hand.
1849	Lowell	Mass.	200,000	25	5	Do.	50,000	3 25	....	....	
1852	Lynchburg	Va.	70,000	25	5	Do.	6,000	3 80	....	....	
1852	Lynn	Mass.	55,000	50	4	Do.	20,000	4 00	....	....	
1859	Lyons	N. Y.	30,000	100	—	Do.	4,000	4 00	....	....	
1852	Macon	Ga.	75,160	25	6	Do.	5,000	5 00	....	....	
1851	Madison	Ind.	160,000	25	3	Do.	10,100	3 50	....	....	
1855	Madison	Wis.	100,000	25	—	Do.	5,000	5 00	....	....	
1854	Malden & Melrose	Mass.	50,600	25	3	February & August.	5,000	4 00	....	....	
1852	Manayunk	Pa.	40,000	100	—	Do.	7,000	4 00	....	....	
1852	Manchester	N. H.	100,000	100	5	January & July.	25,000	3 00	....	....	
1830	Manhattan (N. Y. City)	N. Y.	4,000,000	50	5	Do.	600,000	2 50	300	375	
	Mansfield	O.	25,000	—	—	Do.	10,000	4 00	....	....	
1854	Marblehead	Mass.	40,000	100	3	Do.	1,000	4 00	....	....	
	Marlboro'	Mass.	20,000	—	—	Do.	8,000	4 00	....	....	
	Mauch Chunk	Pa.	50,000	50	—	Do.	7,000	4 00	....	....	
1857	Marietta	O.	50,000	50	—	Do.	7,000	4 00	....	....	
1860	Marion	O.	12,000	25	5	April & October.	1,500	3 55	....	....	Stock firm.
1858	Marysville	Cal.	50,000	100	—	January & July.	4,000	12 50	....	....	
1857	Massillon	O.	20,000	25	—	Do.	5,000	3 00	....	....	
1855	Meadville	Pa.	39,500	25	—	Do.	4,000	3 50	....	....	
	Medina	N. Y.	2,000	100	—	Do.	2,000	7 00	....	....	
1852	Memphis	Tenn.	800,000	100	5	June & December.	12,000	3 50	....	....	
	Meriden	Ct.	20,000			Do.			....	....	
1859	Metropolitan (N. Y. City)	N. Y.	1,000,000	100	—	January & July.	200,000	2 50	....	....	
1859	Middleboro'	Mass.	15,000	—	—	Private Works.		6 00	....	....	
1858	Middletown	Ct.	50,000	25	3	March & September.	5,000	3 80	....	....	
	Middletown	N. Y.		25	—	Private Works.	3,000	3 00	....	....	Owned by G. T. Sutton.
	Milford	Mass.	20,000	—	—	Do.		4 00	....	....	
	Milledgeville	Ga.	100,000	50	—	Do.		5 00	....	....	
	Milton	Pa.	10,000			Do.			....	....	
1847	Milwaukee	Wis.	400,000	50	5	January & July.	24,000	3 50	150	....	
1852	Mobile	Ala.	200,000	—	—	Do.	30,000	4 50	....	....	
1856	Monroe	Mich.	40,000	50	—	Do.	5,000	3 50	50	....	
1852	Montgomery	Ala.	100,000	25	4	February & August.	7,000	6 00	....	....	
1856	Montpelier	Vt.	30,000	25	5	January & July.	5,000	4 50	....	....	
1859	Morrisania	N. Y.	30,000	50	—	Do.		4 00	....	....	
1859	Morristown	N. J.	18,000	50	—	Do.	3,500	4 00	....	....	
1854	Mount Holly	N. J.	16,650	25	3	April & October.	2,000	7 00	....	....	
	Mount Vernon	O.	50,000	100	—	Do.		4 00	....	....	
1857	Muscatine	Iowa.	50,000	100	—	January & July.	3,000	4 50	....	....	
1854	Nantucket	Mass.	50,000	100	3	February & August.	6,000	4 00	....	....	

GAS-LIGHT COMPANIES IN THE UNITED STATES.—Continued.

Compiled from official sources expressly for the AMERICAN GAS-LIGHT JOURNAL.

CORRECTED BY JOHN B. MURRAY, No. 39 NASSAU STREET, NEW YORK, DEALER IN GAS-LIGHT SHARES.

When Chartered.	Town.	State.	Chartered Capital.	Par Val. per Sh. $	Semi-Ann'l Div.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
1852	Nashua	N. H.	45,000	50	3½	January & July.	10,000	3 50	....	....	
1850	Nashville	Tenn.	260,000	50	5	Do.	25,000	3 50	....	....	
1858	Natchez	Miss.	46,000	50	—	Do.	20,000	5 00	....	....	
1852	New Albany	Ind.	200,000	50	3½	Do.	16,000	3 50	....	....	
1846	Newark	N. J.	362,000	50	5	Do.	45,000	3 62	130	....	Always a favorite stock.
1856	Newark	O.	30,000	100	—	Do.	7,000	5 40	....	....	
1852	New Bedford	Mass.	130,000	100	5	Do.	15,000	2 90	102	....	Well managed and kept quiet.
1859	Newbern	N. C.	22,000	100	6	Do.	6,000	3 50	....	....	
	New Britain	Ct.	30,000	20	5	Do.	3,000	4 00	....	....	
1851	New Brunswick	N. J.	100,000	20	4	Do.	8,000	3 00	115	....	
1852	Newburg	N. Y.	67,000	20	4	Do.	10,000	4 00	105	....	
1852	Newburyport	Mass.	150,000	10	4	Do.	9,000	4 00	92½	....	
1857	Newcastle	Del.	32,300	10	3	Do.	4,000	4 00	90	....	
1847	New Haven	Ct.	250,000	25	4	Do.	30,000	3 00	155	....	None in market.
1858	New London	Ct.	70,000	50	3	Do.	12,000	4 00	105	....	Do.
1835	New Orleans	La.	1,500,000	100	6	Do.	120,000	4 00	180	....	
1858	Newport	R. I.	180,200	100	4	Do.	10,000	3 50	112	....	
1854	Newton & Watertown	Mass.	300,000	100	2	Do.	10,000	4 00	....	....	
	Newton	N. J.	30,000	—	—	Do.	3,000	4 00	....	....	
	Newton	Pa.	20,000	50	—	Do.	2,000	4 00	....	....	
1823	Newtown	N. Y.									
1859	New York	N. Y.	1,000,000	50	5	May & November.	100,000	2 50	300	....	
	Niagara Falls	N. Y.	15,000	25	—	Do.	3,000	4 00	90	....	
	Norfolk	Va.	60,000	25	—	Do.	40,000	4 00	....	....	
1858	Norristown	Pa.	41,700	25	4	June & December.	8,000	3 50	....	....	
1855	North Attleboro'	Mass.	50,000	100	3½	Do.	6,000	4 00	....	....	
	Northern Liberties	Pa.	400,000	25	7	City Works.	40,000	2 50	....	....	
	North Adams	Mass.	25,000	—	—	March & September.	30,000	4 00	....	....	
1856	Northampton	Mass.	35,000	25	3	January & July.	4 500	4 00	....	....	
1859	North Bridgewater	Mass.	16,000	100	4	June & December.	1,000	7 00	....	....	
1856	Norwalk	Ct.	30,000	150	4	February & August.	6,000	4 00	....	....	
1859	Norwalk	O.	30,000	25	—	January & July.	4,000	4 00	....	....	
1854	Norwich	Ct.	75,000	25	3½	Do.	12,000	3 50	....	....	
1861	Norwich	N. Y.	12,000	50	—	Do.	2,500	4 00	....	....	
1859	Nyack	N. Y.	20,000	100	—	Do.	2,500	4 00	....	....	
1860	Oberlin	O.	10,000	—	—	Do.	1,200	4 00	....	....	
1855	Ogdensburg	N. Y.	75,000	50	5	Do.	9,000	4 00	....	....	
1859	Orange	N. J.	65,000	25	—	Do.	6,000	3 50	....	....	
1852	Oswego	N. Y.	81,250	100	3½	Do.	15,000	4 00	105	....	Good works, built by Hoy, Jr., & Kennedy.
1855	Ottawa	Ill.	45,000	100	6½	Do.	6,000	4 00	....	....	
1856	Owego	N. Y.	40,000	50	3½	Do.	5,000	4 00	....	....	
1860	Owensboro'	Ky.	25,000	25	—	Do.	4,000	3 50	....	....	
1856	Paducah	Ky.	75,000	100	—	May & November.	4,000	5 00	....	....	
1861	Painsville	O.	40,000	25	5	Do.	2,500	5 00	....	....	
1856	Palmyra	N. Y.	12,000	25	—	January & July.	3,000	7 00	....	....	
1847	Paterson	N. J.	125,000	25	3	Do.	20,000	3 50	95	....	
1850	Pawtucket	R. I.	75,000	50	4	Do.	12,000	3 00	....	....	
1855	Peekskill	N. Y.	31,000	50	3	June & December.	4,000	4 00	....	....	Surplus $10,000, May 15, 1863.
1860	Penn Yan	N. Y.	12,000	50	5	Do.	3,000	4 00	....	....	Works leased to Gilbert T. Sutton.
1859	Peoples', Chicago	Ill.	500,000	50	New	Do.	100,000	2 50	....	....	What is this Company doing?
1855	Peoria	Ill.	100,000	50	4	Do.	8,000	3 50	....	....	
1852	Petersburg	Va.	120,000	—	5	January & July.	20,000	3 50	....	....	
1841	Philadelphia	Pa.	3,000,000	50	—	City Works.	650,000	2 00	....	....	
1855	Piqua	O.	50,000	50	—	January & July.	6,500	4 00	....	....	
1835	Pittsburg	Pa.	300,000	100	5	Do.	60,000	1 50	115	....	
1854	Pittsfield	Mass.	50,000	100	5	Do.	4,500	4 00	....	....	
1858	Placerville	Cal	30,000	50	—	Do.	4,500	10 00	....	....	
1860	Plainfield	N. J.	25,000	50	—	Do.	2,500	4 00	....	....	
1859	Plattsburg	N. Y.	16,000	50	—	January & July.	5,000	7 00	....	....	
1858	Plymouth	Mass.	40,000	100	—	April & October.	8,000	4 00	....	....	
1860	Port Chester	N. Y.	50,000	50	—	Do.	4,000	4 00	....	....	
1860	Port Jervis	N. Y.	20,000	100	—	Do.	3,000	4 10	....	....	
1849	Portland	Me.	300,000	50	4	January & July.	30,000	3 00	....	....	
1859	Portland	Oreg.	50,000	50	—	Do.	3,500	8 00	....	....	
1859	Port Lavacca	Texas.	50,000	100	—	Do.	2,500	7 00	....	....	
1851	Portsmouth	N. H.	70,000	100	8	April & October.	6,500	3 70	....	....	
1855	Portsmouth	O.	50,000	50	4	January & July.	10,000	3 50	....	....	
1855	Portsmouth	Va.	100,000	50	4	Do.	4,000	4 00	....	....	
1856	Portsmouth	Pa.	20,000	50	3	Do.	3,500	4 00	....	....	
1850	Pottstown	Pa.	110,000	50	2	Do.	10,000	3 50	....	....	
1850	Pottsville	N. Y.	84,600	25	4	March & September.	15,000	3 50	120	110	
1848	Poughkeepsie	R. I.	1,000,000	50	4	January & July.	60,000	3 00	122	....	
1858	Providence	Ill.	300,000	50	4	June & December.	12,000	3 50	....	....	
	Quincy	Mass.	00,000	00	—	Do.	00,000	0 00	....	....	
1855	Quincy	Wis.	43,500	26	—	Do.	7,000	3 50	....	....	
1857	Racine	N. J.	50,000	20	—	January & July.	5,000	4 00	....	....	
1858	Rahway	N. C.	25,000	100	6	May & November.	5,000	6 00	....	....	
1848	Raleigh	Pa.	100,000	25	4	January & July.	25,000	3 00	....	....	
1851	Reading	Va.	341.975	—	—	City Works.	30,000	3 00	....	....	Jeff. Davis has extinguished the gas-lights of Richmond, Va.
1859	Richmond	Mass.	40,000	25	—	January & July.	3,000	4 00	....	....	
	Richmond	N. Y.									
	Richmond County	O.	30,000	50	—	Do.	2,000	4 50	....	....	
1862	Ripley	N. Y.	200,000	50	5	Do.	50,000	2 50	....	....	
1857	Rochester	Ill.	40,000	50	—	Do.	4,000	4 00	....	....	
	Rockford	Ill.	100,000	50	—	Do.	6,000	4 50	....	....	
1854	Rock Island	Me.	50,000	100	—	Do.	6,000	4 40	....	....	
1852	Rockland	N. Y.	85,000	100	3½	Do.	10,000	3 60	....	....	
1854	Rome	N. Y.	65,150	20	3½	June & December.	10,000	3 80	....	....	
1854	Rondout and Kingston	Mass.	150,000	100	5	January & July.	20,000	3 50	....	....	
1859	Roxbury	Vt.	20,000	25	—	Do.	4,000	3 50	....	....	
	Rutland	Me.	71,600	100	3½	April & October.	8,000	4 00	....	....	
1857	Saco	Cal.	500,000	100	—	Do.	40,000	10 00	....	....	
1859	Sacramento	N. Y.	20,000	—	—	Do.	4,000	4 00	....	....	
1858	Sag Harbor	Vt.	15,000	20	—	Do.	3,000	7 00	....	....	
	Saint Albans	Vt.	30,000	25	—	Do.	4,000	4 00	....	....	
	Saint Johnsbury	Mo.	50,000	100	5	January & July.	6,000	5 00	....	....	
1857	Saint Joseph	Mo.	600,000	50	—	June & December.	180,000	3 50	....	....	
1859	Saint Louis	Min.	200,000	50	3	January & July.	10,000	6 00	....	....	Surplus $10,000, May 15, 1863.
1857	Saint Paul	N. J.	30,000	25	3	Do.	5,000	3 86	....	....	
1856	Salem	Mass.	200,000	100	4	February & August.	30,000	3 24	....	....	
1850	Salem	O.	25,000	20	—	Do.	3,000	3 00	....	....	
1859	Salem	N. C.	14,600	50	6	May & November.	3,500	6 60	....	....	
1859	Salisbury	Mass.	1,250	25	—	Do.	3,000	4 00	....	....	
	Salisbury Mills	Me.	25,000	100	—	Do.	3,000	4 00	....	....	
	Salmon Falls	Texas.	75,000	20	—	Do.	40,000	6 00	....	....	
	San Antonio	Cal.	30,000	50	—	Do.	50,000	10 00	....	....	
	San Diego	O.	75,000	50	—	April & October.	9,000	3 00	....	....	
1854	Sandusky	Mass.	10,000	—	—	Private Works.	2,000	3 50	....	....	
1859	Sandwich	Cal.	1,000,000	100	6	Do.	50,000	8 00	110	....	
1852	San Francisco	N. Y.	39,000	100	—	January & July.	6,000	3 60	70	....	
1858	Saratoga Springs	N. Y.	30,000	20	—	Do.	4,000	3 00	....	....	
	Saugerties	Ga.	200,000	25	5	Do.	10,000	3 75	....	....	
1849	Savannah	N. Y.	50,000	—	—	Private Works.	11,000	4 00	....	....	
1851	Schenectady	Pa.	100,000	25	—	January & July.	6,000	3 80	....	....	About trying Water-Gas.
1858	Scranton, Gas and Water	Ala.	20,000	100	—	Do.	2,000	5 00	....	....	
1857	Selma	N. Y.	80,000	50	3	Do.	10,000	4 00	100	....	
1856	Seneca Falls and Waterloo	La.	40,000	25	—	Do.	3,000	0 50	....	....	
	Shreveport	N. Y.	40,000	100	—	Do.	3,000	4 00	....	....	
1856	Sing Sing	Del.						4 00	....	....	Petroleum Gas.
	Smyrna	Mass.	10,000	25	—	Do.	3,000	4 00	....	....	
1860	South Adams	Mass.	5,000	25	—	Do.	4,010	6 00	....	....	
1859	South Bridge	Mass.	200,000	50	—	Do.	60,000	3 25	110	....	
	South Boston	O.	200,000	100	—	Do	20,000	3 50	....	....	
	Springfield	Ill.	75,000	50	—	January & July.	10,000	3 50	....	....	
1854	Springfield	Mass.	100,000	500	5	February & August.	10,000	3 60	140	....	
1848	Springfield	Ct.	6,250	25	5	April & October.	3,000	3 50	....	....	
1855	Stamford	N. Y.	150,000	50	5	January & July.	26,000	4 00	95	....	
1857	States Island										

GAS-LIGHT COMPANIES IN THE UNITED STATES.—Continued.

Compiled from official sources expressly for the AMERICAN GAS-LIGHT JOURNAL.

CORRECTED BY JOHN B. MURRAY, No. 39 NASSAU STREET, NEW YORK, DEALER IN GAS-LIGHT SHARES.

When Chartered.	Town.	State.	Chartered Capital.	Par Val. per Sh. $	Semi-Ann'l Div'd.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
1859	Staunton	Va.	18,000	50	6	January & July.	4,000	7 00	....	....	
	Steubenville	O.	150,000	100	—	Do.	15,000	4 00	....	....	
	Stockton	Cal.	50,000	—	—	Do.	8,000	10 00		....	
1848	Syracuse	N. Y.	125,000	25	5	March & September.	25,000	3 00	112	....	
	Tamaqua	Pa.	40,000	25	—	Do.	3 000	4 00	....	....	
1859	Tarrytown and Irvington	N. Y.	70,000	50	—	January & July.	3,000	4 00	....	....	
1853	Taunton	Mass.	100,000	50	4	Do.	10,000	4 00	....	....	
	Terre Haute	Ind.	100,000	100	—	Do.	3,000	4 00	....	....	
	Thompsonville	Ct.	25,000	50	—	Do.	4,000	4 50	....	....	
	Tiffin	O.	25,000	20	—	Do.	4,000	4 00	....	....	
1853	Toledo	O.	100,000	50	3	Do.	8,000	3 50	....	....	
1847	Trenton	N. J.	100,000	20	4	Do.	15.000	3 42	....	110	
1848	Troy	N. Y.	200,000	100	4	June & December.	35,000	3 60	160	....	
1856	Urbana	O.	30,000	25	—	April & October.	3,500	4 00	....	....	
1849	Utica	N. Y.	80,000	100	4	Do.	22,000	3 60	....	....	
1853	Vicksburg	Miss.	66,000	50	—	March & September.	4.000	4 50	....	....	
1859	Vincennes	Ind.	25,000	100	—	January & July.	2,000	4 00	....	....	
1858	Walden	N. Y.	2,500	—	—	Private Works.	1,000	6 00	....	....	
1853	Waltham	Mass.	100,000	100	4	January & July.	3,000	4 00	....	....	
1857	Ware	Mass.	30,000	20	—	Do.	3,500	4 00	....	....	
1861	Warren	O.	30,000	50	—	Do.	4,000	3 00	....	....	
1854	Warren	R. I.	20,000	25	—	Do.	3,000	4 00	....	....	
1855	Washington	D. C.	500,000	20	5	Do.	50,000	3 25	150	148	
1859	Washington	N. C.	15,000	100	—	April & October.	1,500	6 00	....	...	
1848	Washington	Pa.	20,000	25	4	January & July.	4,000	3 00	....	....	
1854	Waterbury	Ct.	100,000	25	—	Do.	4,000	4 00	....	....	
1852	Waterford	N. Y.	12,000	25	—	Do.	4,000	4 00	....	....	
1852	Watertown	N. Y.	20,000	100	—	Do.	10,000	7 00	....	....	
1856	Watertown	Wis.	25,000	100	—	Do.	5,000	5 00	....	....	
1858	Wautoma	Wis.	30,000	50	—	Do.	3,000	4 50	....	....	
1857	Waverly	Miss.	20,000	100	—	April & October.	4,000	5 00	....	....	
1854	West Cambridge	Mass.	60,000	100	—	February & August.	10,000	4 00	....	....	
1852	Westchester	Pa.	100,000	25	2½	Do.	3,500	3 50	....	....	
	Westfield	Mass.	25.000	100	6	Do.	4,000	4 00	....	....	
	Weston	O.	20,000	25	—	Do.		5 00	....	....	
1857	West Point	N. Y.	50.000	—	—	United States Military	Academy.	2 00	....	....	
1853	West Troy	N. Y.	100,000	50	3	January & July.	10,000	3 60	85	....	
1850	Wheeling	Va.	75,000	25	6	Do.	12,000	2 70	....	....	
	White Plains	N. Y.	20,000	20	—	Do.			....	....	
1856	Wilkesbarre	Pa.	50,000	50	—	May & November.	4,000	3 33	100	80	
1850	Williamsburg	N. Y.	1,000,000	50	5	January & July.	60,000	3 00	....	....	
1858	Williamsburg	Va.	30,000	25	—	Do.	3,000	4 00	....	....	Camp-fires of the Union Army light up this place at present.
1857	Williamsport	Pa.	70,000	25	4	Do.	3,500	3 80	....	....	
1859	Willimantic	Ct.	12,000	—	—	Do.	2,500	3 50	....	....	
1853	Wilmington	N. C.	60,000	50	5	Do.	8,000	5 00	....	....	
1852	Wilmington	Del.	200,000	50	5	February & August.	20.000	3 00	....	....	
1854	Winchester	Va.	36,000	50	6	January & July.	5,000	4 00	....	....	
	Windsor	Vt.									
	Woburn	Mass.	20,000	—	—	Do.	3,000	4 00	....	....	
1856	Woodstock	Vt.	10,000	50	4	Do.	4.000	6 00	....	....	
1853	Woonsocket	R. I.	82,600	100	4	April & October.	4,000	3 50	....	....	
1856	Wooster	O.	25,000	50	—	January & July.	6 000	3 00	....	....	
1849	Worchster	Mass.	160,000	100	5	Do.	15,000	3 50	....	....	
1855	Xenia	O.	40,000	50	—	Do.	3,000	4 00	....	....	
1854	Yonkers	N. Y.	75,000	50	3½	Do.	6,500	4 00	102½	....	
1849	York	Pa.	40,000	57	3	June & December.	10,000	3 50	....	....	
	Yorkville	S. C.	20.000	25	—	Do.	4,000	4 00	....	....	
1858	Ypsilanti	Mich.	20,000	50	5	February & August	6.000	14 00	....	....	
1850	Yreka	Cal.	30,000	100	—	Do.	2,000	0 00	....	....	
1848	Zanesville	O.	44,600	25	4	Do.	10,000	3 50	....	....	

GAS-LIGHT COMPANIES IN THE BRITISH PROVINCES OF NORTH AMERICA.

When Chartered.	Town.	Province	Chartered Capital.	Par Val. per Sh. $	Semi-An'l Div'd.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
1854	Belleville	C. W.	38.040	100	4	January & July.	1,200	5 00	....	....	
1854	Brantford	C. W.	32,000	100	2½	Do.			....	....	
	Brockville	C. W.	50,000	—	—	Do.	5,000	4 00	....	....	
	Chatham	N. B.	50,000	—	—				....	....	
1854	Charlotte Town	P. E. I.	50,000	100	5	Do.	3.000	3 50	....	....	
1857	Cobourg	C. W.	30,000	—	—	February & August.	4,000		....	....	
	Dundas	C. W.	30,000	—	—	Do.	6,000	4 00	....	....	
	Frederick	N. B.	50,000	—	—	Do.			....	....	
1843	Halifax	N. S.	160,000	40	7	May.	30,000	3 00	....	....	
1850	Hamilton	C. W.	125,000	40	5	March & September.	20,000	3 50	....	....	
1848	Kingston	C. W.	80,000	100	—	Do.	6,000	3 50	....	....	
1853	London	C. W.	100,000	20	5	May & November.	5,000	5 00	....	....	
1847	Montreal	C. E.	400,000	40	—	March & September.	110,000	2 80	....	113	Last sale at this figure.
1854	Ottawa	C. W.	40,000	40	5	Do.	5,000	4 50	....	....	
1850	Point Levi	C. E.	25,000	25	—	January & July.	4,000	3 50	....	....	
1859	Port Hope	C. W.	28,000	20	4	May & November.	4,500	3 50	....	....	
1847	Quebec	C. E.	200,000	200	4	January & July.	60,000	3 00	....	....	
1848	Saint Catherine's	C. W.	80,000	20	—	May & November.	7,000	4 50	....	....	
1859	Saint Hyacinthe	C. E.	15 000	20	—	Do.	4,000	4 00	....	....	
	Saint John	N. B.	170,000	85	—	June & December.	25,000	3 50	110	110	Sales at this figure.
	Saint John's	N. F.	50,000	—	4	Do.	30,000		....	....	
1858	Sorel	C. E.	14,000	20	4	Do.	4,000	3 00	....	....	
1848	Toronto	C. W.	400,000	100	4	February & August.	50,000	3 33½	....	....	

GAS-LIGHT COMPANIES IN CUBA, MEXICO, SOUTH AMERICA AND NEW ZEALAND.

When Chartered.	Town.	State.	Chartered Capital.	Par Val. per Sh. $	Semi-An'l Div'd.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
	Callao	Chile.		—	—	January & July.	20,000	7 00	....	....	
	Cardenas	Cuba.	50,000	—	—	Do.	180,000	5 00	....	....	
1857	Compania Cubana	Hav'a.	500,000	500	10	Do.			....	....	
	Cienfugos	Cuba.		—	—	Do.	12,000	5 00	....	....	These four towns are lighted by the Compania Cubana of Havana.
	Guanabacoa	Cuba.		—	—	Do.	14,000	5 50	....	....	
	Regla	Cuba.		—	—	Do.	10,000	5 00	....	....	
	Trinidad	Cuba.		—	—	Do.	16.000	5 00	....	....	
	Guyaquil	S. A.	150,000	—	—	Do.	85,000		....	....	
	Havana	Cuba.	1,250,000	500	7½	Do.	300,000	5 00	....	....	
	Lima	Peru.	100,000	—	—	Do.	150,000		....	....	
	Maranham (Chartered)			—	—	Do.			....	....	
	Matanzas	Cuba.	50,000	—	—	Do.	180,000	8 50	....	....	
	Mexico City	Mex.	550,000	—	—	Do.			....	....	
	Montevido	S. A	500,000	—	—	Do.			....	....	
	Para (Chartered)			—	—	Do.			....	....	
1854	Rio de Janeiro	S. A.	1,000,000	500	7½	Do.	300,000	4 00	....	....	
	San Iago	Chile.	500,000	—	—	Do.	180,000	7 00	....	....	
1857	Saint Jago de Cuba	Cuba.	450,000	500	—	Do.	25,000	5 00	....	....	
	Valparaiso	Chile.	500,000	—	—	Do.	85,000	6 00	....	....	
	Vera Cruz	Mex	500,000	—	—	Do.			....	....	
	Ville Clara	Cuba.	50,000	—	—	Do			....	....	
	Auckland	N. Z.		—	—	Do.			....	....	

DESCRIPTION OF A PHOTOMETER.

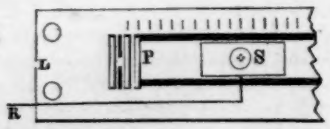
BY PROF. O. N. ROOD.

(From Silliman's Journal.)

Dove, a short time ago, proposed a photometer, consisting essentially of a compound microscope provided with a mimroscopic photograph, the latter being used as a "screen," and illuminated from both sides, in such a way that when the compensation had been reached, the photograph was rendered invisible.* In the construction of the instrument at present described, I have availed myself of this general mode of comparison, discarding, however, the microscope and photograph, and supplying their place in a more simple, and, for many purposes, in an at least equally efficient manner.

The instrument consists of a board from 50 to 100 inches in length and 12 inches wide; a slide at S supports

1.



a small lamp or standard candle; the slide can be moved towards or away from the screen P by a light rod R; the screen, reckoning from L, is composed of four parts, disposed thus: 1st, a glass plate is coated with a collodion sensitized with iodid of potassium and of the variety called adherent; this is immersed in a solution of nitrate of silver, just as though it was to be used for the reception of the camera image; it is then exposed to broad daylight for two minutes, and developed by sulphate of iron, washed and dried. By this operation a dense and absolutely opaque deposit of silver is produced in the substance of the collodion. The collodion film is then removed from one spot ½ an inch square; this can be done neatly and completely by the use of a needle, great care being taken to leave the edges of the little square sharp and clean. The observations are made by means of this spot, and it of course is to be located in the axis of the instrument. On account of the uniformity of the appearance of this plate by reflected light, and the sudden, sharp, transition from the thin, opaque edges of the film to the clear glass, the screen is, I suppose, better adapted for use than any which has yet been proposed. The collodion side of the glass plate is turned towards L.

2d. Next in order comes a piece of blackened cardboard of the same size with plate No. 1; this is provided with an aperture corresponding with, and somewhat larger than, the exposed portion of the collodion plate.

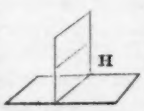
3d. Then follow two thin, finely ground glass plates of the same size with No. 1, the ground surfaces facing towards L. A single plate of ground glass can be used, but with two plates the illumination of the square spot is much more uniform and even; in other words, by the use of two plates all idea of the ground glass *texture* is removed, and nothing is seen but a square patch of light.

Two small lamps or standard candles are placed about as indicated at L. The construction of the lamps is the same with those used by Potter (*Physical Optics*, page 112,) in his photometric experiments, consisting, viz.: of shallow cups filled with oil, which support little metallic bridges, formed of thin plates of metal perforated with four holes, through two of which small wicks are drawn, the others supplying air. When properly arranged these lamps will give a pretty uniform light for thirty minutes together; but though by no means furnishing a truly constant illumination, yet the variation is almost always gradual and steady, a point of great importance, for this being the case, it is easy to make the observations in such a manner as nearly to exclude errors from this source, as will presently be shown.

The movable lamp is provided with a vernier, and a scale divided into inches and tenths extends from that ground glass surface next to the collodion plate along the entire length of the board. At L is a shade to protect the eyes while observing; this has an aperture one inch square placed in the axis of the instrument. The photometer, when arranged as above described, is peculiarly adapted to measure the amount of light transmitted by plates of colorless or colored substances, as well as the amount of light reflected from polished or unpolished plane surfaces at various angles of incidence. For these uses it was expressly contrived, but at the same time it is plain that by modification it can be adapted to other purposes.

Mode of using the Instrument.—The three lamps, after being lighted, are allowed to burn for twenty or thirty minutes, till their light has become steady, then the centre of the flame of the slide lamp is made to coincide with the vernier by using the arrangement seen in fig. 2; this is constructed of wood, and all its angles are right angles. The vernier being placed at H, the eye is brought opposite the dotted line in such a way that the surface of the upright is reduced apparently to a line, when the lamp is moved on the slide till this line bisects the flame. The slide is then placed about as distant from the screen as may be desired, and, compensation approximately effected, by moving the pair of lamps at L away from or towards the collodion surface. If these are brought too near the screen, the square spot will appear dark on a light ground; if too far off, light on a dark ground. The final compensation is made by moving the slide lamp S; this takes place when the spot becomes invisible. In the first experiments, instead of a *pair*, a single lamp was used, and owing to this the spot never became entirely invisible; one-half was always faintly lighter than the adjacent ground, the other half darker; this was owing to the slight difference in the distances of the sides of the square from the lamp, and may be adduced as a proof of the delicacy of the photometer. The observer then reads off on the scale the distance of the slide lamp from the ground glass surface next to the collodion plate, the white page of the note-book reflecting sufficient light for the purpose. Supposing it is desired, for example, to measure the amount of light transmitted by a plate of polished glass at a perpendicular incidence, the plate is placed at P, when it will be found necessary to bring the slide lamp nearer in order to effect compensation. The amount of light transmitted is then at once calculated by the law that "the intensities which measure the values of the illuminating powers are *directly* as the squares of the distances from the screen."

2.

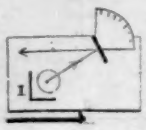


My mode of work, in all cases, has been to alternate the observations, reading off first the distance of the free flame; 2d, that found with the plate of glass under experiment; 3d, free flame; 4th, plate of glass, &c.; and as the variations in the brightness of the lamps are generally slow and steady, by this mode, the error from this source is very greatly reduced.

Dove considers this form of photometer the only one which is capable of comparing the intensity of two masses of light having different colors; the degree of accuracy attainable in this direction can be judged of by the experiments detailed below. As the square spot will in such cases be differently colored from the ground, it always remains plainly visible, but there is a moment when the edges of this spot, to a great extent, disappear, and it seems to blend softly into the white ground. This I assume to take place when the illuminations are exactly balanced, and have accordingly employed it as the test in my experiments on colored media. Though the determinations with colored light are on the whole pretty satisfactory, still they by no means reach the accuracy easily attained when the two masses of light are similar in tint. With regard to the following observations, it may be remarked, that those made with colored light show fully the degree of accuracy that can be attained in this direction with the photometer, the experiments, as far as they extend, being made with much care, though in such a way that each reading is entirely independent of the preceding, and has exercised no influence on that which follows.

To measure the amount of light reflected from a polished surface, I have used a plan not unlike that employed by Potter;† the slide, in the place of the lamp, carries the polished plate in an upright position and supported in such a way that it can be rotated on its axis and adjusted properly. Its axis corresponds with the centre of a divided quadrant by which the incidence of the ray can be measured. I is a shade to prevent the light from reaching the screen. The vernier is made to correspond with the perpendicular axis of the mirror, and of course the distance of the lamp's flame from the mirror's axis is always to be added to the reading obtained. By removing the shade I, and placing it so as to protect the mirror from light, the direct light of the lamp falls on the screen. As the lamp stands then a little obliquely, the slight error thus introduced must be allowed for, or, what is better, the lamp and mirror may be placed on either side of, and at equal distances from, the axis of the photometer.

3



Prof. Silliman, Jr., pointed out to me some weeks ago, that small errors might be introduced by reflection from the walls of the room. This is guarded against by the use of several blackened shades properly disposed about the instrument, or by experimenting in a room with blackened walls, as is usual in determining the photometric power of illuminating gas.

Determination of the amount of light transmitted by a plate of colorless, polished, crown glass 1-12 of an inch thick:

Flame free.	With plate.
27.7 inches.	19.95 inches.
20.85 "	19.9 "
20.8 "	19.9 "

Amount of light transmitted, 91.09 per cent.

Determination of the amount of light transmitted by a plate of colorless glass, finely ground on one side, 1-12th inch thick:

Flame free.	With ground glass.
20.2 inches.	13.1 inches.
20.35 "	12.8 "
	13.1 "
	13.05 "

Amount of light transmitted, 41.13 per cent.

Determination of the amount of light transmitted by one plate of polished orange colored glass, 1-10th inch thick:

No. 1.		No. 2.		No. 3.	
Flame free.	Orange glass	Flame free.	Orange glass.	Flame free.	Orange glass.
23.05	15.50	22.10	15.50	22.2	15.40
22 60	15 80	22.20	15.75	22 2	15.65
22.60	15.40	22 40	15.40	21.15	15.10
22.64	15.80	22.60	15.60	21.8	15.00
22.15	15 65	21.90	15.50	21.2	14.3
22.35	15.50				
Amount of light transmitted,	47.45		48.74		48.42 per cent.

Determination of the amount of light transmitted by a plate of deeply colored red glass, 1-10th of an inch thick:

Flame free.	Red glass.	Flame free.	Red glass.	Flame free.	Red glass.
21.5	7.3	21.10	6.7	20.9	6.5
21.	6.3	21.15	6.6	20.2	6.7
22.	7.2	21.40	6.9		7.0
22.	6.7		6.8		6.2
	6.7		6.6		
Light transmitted,	10.03		10.05		10.36 per cent.

Peace Dale, R. I., May 7th, 1863.

* *Pogg. Annalen*, Band cxiv, page 145.

†Physical Optics, p. 112.

GAS IN ENGLAND.—At Peterborough the directors of the gas company recommend a divided of 8½ per cent. They also report that the lowering of the meter rents has increased the numbers of consumers.

At Worcester the price of gas been reduced to 4s. 6d. per thousand cubic feet.

At Bristol, the gas company have declined to reduce the price to 3s. per thousand, or to accede to other requirements made by the Committee of the Bristol Gas Consumers' Association. An opposition company will probably be the result of this refusal.

At Halesworth, the gas company have declared a divided of £7 10s. per cent., "which, considering the mildness of the winter, and the fact that the company last year reduced the price of gas 10d. per thousand feet, cannot fail to be satisfactory to both shareholders and consumers."

At Galashiels, the gas company have declared a dividend of 7½ per cent. and reduced the price of their gas from 6s. 5½d. to 5s. 10d.

The Brechin Gas Company have declared a dividend of 10 per cent.

PETROLEUM ITEMS.

Active Demand for Petroleum in Antwerp.—A correspondent of the *Evening Post*, thus writes of the unprecedented demand for petroleum now existing in Antwerp:

With the elastic and "oily" adaptability of humanity to circumstance, the admirers here of King Cotton and Prince Turpentine, and other Southern potentates, have raised to their vacant thrones a new monarch. Petroleum is now the "one thing needful" in Antwerp. Three years ago it was absolutely an unknown article, but the imports of last year amounted to 1,400,000 gallons, and the imports for 1863 will foot up fully 6,000,000 gallons. Already nearly twenty refineries of crude petroleum have been started in different parts of Belgium, and various circumstances (including the high import duties into France and the very low duties between that country and Belgium) combine to make Antwerp the great distributing petroleum port for the continent. Nor is the excitement in the article confined to Antwerp, for in Paris and other cities it has become the object of speculative gambling and contracts on thirty and sixty days, and even six months' time, are entered into with all the *vim* of stock gamblers. Even Russia has become inoculated with the mania, and the merchants of St. Petersburg watch the quotations from London and Liverpool with as much care as they do the prices current of tallow, their great speculative commodity. To an American it seems very familiar to see the merchants at the Antwerp Bourse discussing the invasion of Pennsylvania in connection with its proximity to the oil wells of the Pittsburg district, and its endangering the foreign supply of petroleum. The Antwerp dealers, in their anxiety to get the latest American news, have organized a regular system of despatches from the steamers on their arrival at Queenstown, and as much as one hundred francs is paid for a single telegram, simply giving the features of the New York market. Petroleum has risen here within a fortnight twelve to fifteen francs per kilogramme, and at the date of writing stands at 82 to 84 francs. This traffic seems to be taken up here with the more avidity under the impulse of the stories of large fortunes made in other markets in cotton and Southern products affected by the war

Petroleum Loaded in Bulk for Europe.—The *Coal Oil Circular* says that the three-masted British schooner *Jane* is loading at West Philadelphia with crude petroleum in bulk. The vessel is thus described:

This craft is a curiosity in her way. A strong, well-built, wooden vessel, containing twelve iron tanks, ten of which are divided into two compartments, or a lower and an upper tank—that is, divided in the middle—with a sliding cover to the opening of the lower tank, which, when filled, is screwed down, and the upper one filled and secured in the same manner. Each double tank extends only to the middle of the vessel. The weight of the oil thus arranged keeps the vessel in good trim even in the roughest weather. The deck is built over the tanks, with openings for each tank, with tightly fitting cast-iron covers, into which opening a large funnel is placed, and the barrel or cask of oil is emptied from the deck into the tanks. Her capacity is not yet tested, but it will be between 40,000 and 60,000 gallons. Should this latter experiment succeed, and so far it appears entirely satisfactory, it is expected that larger vessels will be constructed to carry oil in bulk. The greatest objection is in the inability to carry any return cargo. The *Jane* came with about 20,000 gallons of water for ballast! The water ballast is pumped out, and re placed with oil. As an offset to carrying freight only one way, we must consider the saving of the cost of barrels, and avoiding all leakage. The oil can be pumped directly from the tanks of the vessel to those of the refinery, or others ready to receive it. The *Jane* came to Mr. G. A. McKinstry, who is agent for the owners, and Mr. D. L. Miller, Jr., is supplying the oil for the cargo. This is the long, low, black schooner, with a red streak above and below her water line, which created some consternation on the coast, under the supposition that she was a pirate.

Exports of Petroleum from Philadelphia.—From January 1st, 1863, to July 25th, there had been exported from Philadelphia 3,749,355 gallons of crude petroleum, worth $931,297.

Dealers Should Protect Themselves against the Passage of too Stringent Laws.—From our London exchanges we learn that a petty persecution of dealers in petroleum is being waged by the Miss Nancys of the neighborhoods where these premises are situated. Instead of resorting to the evidence of scientific men on questions relating to the explosibility of petroleum, "terrified butchers, pawn-brokers, law clerks, and bakers," have been summoned to relate their opinions as to the presence or absence of danger. Referring to this subject the London *Oil Trade Review* says:

A combined and vigorous action is necessary on the part of dealers to put a stop to the evil above alluded to, before it spreads to their greater inconvenience; and as the use of the oil is daily on the increase, one good means that we would suggest for overcoming the slight prejudice that still exists is the dissemination of information regarding the qualities and properties of the oil, so that each housekeeper at least may understand what she is using or about to purchase. We are convinced that this prejudice is the result of a want of the knowledge referred to, aggravated, no doubt, by the efforts of those who see it to their interests to cry down this new and valuable addition to the world's commerce.

The Canadian Oil Regions.—The Oil Springs *Chronicle* says that thirty new wells have been commenced here within a short time, and we look with much anxiety for the result. The test well has now reached a depth of over 400 feet in the rock, and so far, the encouragements have been slight; but those most interested are buoyant with hope and confident of ultimat success.

Pumping.—The *Chronicle* also informs us that every available pump is now in use, many of them running day and night, with a varying yield of three to twenty-five barrels per day. Engines are being generally introduced for the business. Not less than a dozen portable ones are already busy pumping or drilling, the high prices giving a new impetus to the busines on both hands.

Gas from Dead Hindoos.—An eccentric philosopher at Bombay proposes the lighting of the city by gas manufactured from dead Hindoos. He says each body would yield 200 cubic feet of gas: stout ones would yield much more. Now, eight rupees (16s.) per 1,000 cubic feet, would be a moderate charge; therefore, in a monetary point of view, it is calculated that the scheme would pay. Gas originally meant spirit: we suppose the light thus obtainable might be called the shining spirits of deceased Hindoos.—*London Builder.*

GAS-LIGHT IN THE BRITISH MUSEUM.

At a recent meeting of the Committee of Supply of the British House of Commons, the question of lighting the British Museum by gas, was discussed. Our readers will remember that this step was stoutly opposed by the late Mr. Braidwood, on account of the "dessicating" tendencies which that gentleman attributed to gas-flame. Unfortunately his opinion, and the similar opinions of several other wiseacres, were allowed to control the trustees, for the time, at least, and so the Museum is closed at sundown.

At the recent meeting of the Committee, Mr. Ayrton urged the opening of the Museum by gas-light in the evenings, and especially on Monday evenings. Mr. Locke suggested Sunday afternoons, as the time best suited to the working classes. Mr. Covingham thought that the stuffed birds and beasts ought to be removed to some place where they at least could be exhibited to the public at fitting times, and the Museum more exclusively devoted to science and art. Mr. Walpole said he was anxious that the Museum should be open in the evenings, if it could be done, but his firm belief was that it could not be done with safety. He referred to the evidence of Mr. Braidwood, to show that the gas used in lighting the building would render the materials more combustible than they are at present, and would discolor the contents; and he did not suppose that any one would think of incurring the enormous expense of lighting it with oil. They did open the Museum during the summer months to eight o'clock, and what was the result? From ten to six o'clock, 5,200 persons attended, being 650 persons per hour. From seven to eight o'clock 27 persons attended per hour, and the cost was £8 10s. per night. Mr. Ayrton affirmed that the British Museum afforded singular facilities for being lighted with gas, without endangering the building, or causing any of the evils referred to. He hoped the trustees would consider the question.

Philadelphia, Pa.—The following exhibits the amount of water used in Philadelphia during the hot month of July:

Works.	Number of galls. pumped during the month.	Average number of galls. pumped per day.
Fairmount	557,148,468	17,972,531
Spring Garden	199,606,800	6,438,929
Kensington	109,796,200	3,541,812
West Philada	46,137,330	1,688,300
Total	912,688,798	29,441.574

ANTHRACITE COAL TRADE OF THE UNITED STATES.

The following table exhibits the quantity of anthracite coal sent to market from the different regions in Pennsylvania, from the commencement of the trade, in 1820, to 1862, inclusive; together with the annual increase:

Years.	Eastward to tide-water.					Other Regions Westward.	Aggregate.	Annual Increase.	Aggregate in each period of 5 years.	Average annual delivery for each period	Ave. an'l increase of each period over the preceding	Average gain year by year in each period.
	Schuylkill.	Lehigh.	Lackawanna.	Pittston.	Scranton.							
1820	.....	365	.....	.....	.....	.....	365	.....	.....	.....	.....	.....
1821	.....	1,073	.....	.....	.....	.....	1,073	.....	.....	.....	.....	.....
1822	.....	2,240	.....	.....	.....	.....	2,240	.....	.....	.....	.....	.....
1823	.....	5,823	.....	.....	.....	.....	5,823	.....	.....	.....	.....	.....
1824	.....	9,541	.....	.....	.....	.....	9,541	.....	.....	.....	.....	.....
1825	6,500	28,393	.....	.....	.....	.....	34,893	25,352	19,042	3,809	.....	.....
1826	16,767	31,280	.....	.....	.....	.....	48,047	13,154	.....	.....	.....	.....
1827	31,360	32,074	.....	.....	.....	.....	63,434	15 387	.....	.....	.....	.....
1828	47,284	30 232	.....	.....	.....	.....	77,516	14,082	.....	.....	.....	.....
1829	79,973	25,110	7,000	.....	.....	.....	112,083	34,567	.....	.....	.....	.....
1830	89,984	41,750	43,000	.....	.....	.....	174,734	62,651	335,978	67,194	63,385	20,508
1831	81,854	40,966	54,000	.....	.....	.....	176,820	2 086	.....	.....	.....	.....
1832	209,271	70,000	84,600	.....	.....	.....	363,871	187,051	.....	.....	.....	.....
1833	252,971	123,000	111,777	.....	.....	.....	487,748	123,877	.....	.....	.....	.....
1834	226,692	106,244	43,700	.....	.....	.....	376,636	Decrease	.....	.....	.....	.....
1835	339,508	131,250	90,000	.....	.....	.....	560,758	184,122	1,579,809	315,961	248,767	52,911
1836	432,045	148,211	103,861	.....	.....	.....	682,428	121,670	.....	.....	.....	.....
1837	523,152	243.902	115,387	.....	.....	.....	881,476	199.048	.....	.....	.....	.....
1838	433,875	213,615	78,207	.....	.....	.....	739,298	Decrease	.....	.....	.....	.....
1839	442,608	221,025	122,300	.....	.....	11,930	819,327	80 034	.....	.....	.....	.....
1840	452,291	225,318	148,470	.....	.....	15,505	865,414	46,087	3,683,282	736,656	420,695	88,538
1841	584.692	143,087	192 270	.....	.....	21,461	958,899	93,485	.....	.....	.....	.....
1842	540,892	272,546	205,258	.....	.....	57,346	1,108,001	149,102	.....	.....	.....	.....
1843	677,295	267,796	227,605	.....	.....	68,000	1,263,539	155,538	.....	.....	.....	.....
1844	839,934	377,002	251,005	.....	.....	127,998	1,631,669	368,130	.....	.....	.....	.....
1845	1,088,796	429,458	273,435	.....	.....	188,401	2,023,052	391,383	525,827,5	1,165,504	423,848	162,464
1846	1 237,002	523,002	320.000	.....	.....	205,075	2,313,992	320,940	.....	.....	.....	.....
1847	1,583,374	648,978	388,208	.....	.....	299,302	2,982,303	638,317	.....	.....	.....	.....
1848	1,652,885	680,746	437,500	.....	.....	256,627	3,089,238	106,929	.....	.....	.....	.....
1849	1,605,126	801,246	454,210	.....	.....	304,786	3,242,541	153,403	.....	.....	.....	.....
1850	1,712,007	722,622	432,389	111,014	.....	276,359	3,254,021	11 780	13,681,182	2,736.226	1,570,722	322,178
1851	2,184,240	989,296	472,478	316,017	.....	415,099	4,377,130	1,122,809	.....	.....	.....	.....
1852	2,452,026	1,114,026	497,839	426,164	.....	439,342	4,925,695	548,565	.....	.....	.....	.....
1853	2,470,943	1,080,544	494,827	512,659	.....	556,018	5,114 491	188,796	.....	.....	.....	.....
1854	2,895,208	1,246,418	483,406	496 648	.....	676,689	5,753,369	638 878	.....	.....	.....	.....
1855	2,480,768	1,284,114	565,460	504.803	.....	767,156	6,552,301	798,932	28,425,006	4 685 001	1,948,775	504,165
1856	3,258,356	1,351,970	499,650	612 500	122 778	966,293	6,751.542	199.241	.....	.....	.....	.....
1857	2,985,541	1,318,549	480,677	543,878	332,146	759,556	6.420,342	Decrease	.....	.....	.....	.....
1858	2,866.449	1,380,030	348,789	630,056	530,959	734,913	6,491,187	70,845	.....	.....	.....	.....
1859	3,004,953	1.628,311	591,000	688,854	623.146	981.2 2	7,517,516	1,026,329	.....	.....	.....	.....
1860	3,292,828	1 821,674	499,568	701,528	827 954	987,687	8,131 284	613,718	38,782,888	6,746 577	2 061,576	352,829
1861	2,644,402	1,738,377	726,644	629.657	667,176	1,068,661	7,474,917	Decrease	.....	.....	.....	.....
1862	2,890,581	1,351,054	644,100	603,354	769,001	1,223,629	7,481,719	6,802	.....	.....	.....	.....

THE AMERICAN GAS-LIGHT JOURNAL is published on the 1st and 15th of every month, and is the recognized official organ of

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Its purpose is to ascertain and make known all new discoveries in the science and economical application of LIGHT, and promote thereby the interests of companies and consumers; to encourage and aid the introduction of PURE WATER from Lakes and Rivers into Towns and Cities, and to improve the system of SEWERAGE, VENTILATION, HEATING, and DRAINAGE everywhere.

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THE

AMERICAN GAS-LIGHT JOURNAL,

PUBLISHED ON 1ST AND 15TH OF EVERY MONTH.

C. ELTON BUCK, ... EDITOR.

SATURDAY, AUGUST 15, 1863.

The remarkably low price at which crude and refined petroleum may be bought throughout the Province of Canada, has had a most depressing effect upon the prosperity of some of the gas companies of that country. We had anticipated to some extent, results like these, but we were not prepared to hear the full effect of the competition which has ensued, nor the deplorable condition to which some of the best gas companies in the small towns of Canada have been reduced. We have received information direct from the officers of some of these companies, which a year or two ago were in a most flourishing condition, but which now are in a state almost bordering on bankruptcy. An officer of one of these companies writes us, "our stock is not worth a cent, and though we are barely making running expenses, we shall probably soon have to stop entirely." Another superintendent informs us that "unless the oil wells give out, we may as well shut up our works and give up all hopes of making them pay expenses." We have taken some pains to ascertain the effect which the consumption of petroleum would have on country gas companies. From the examples we have given it is seen that in some parts of Canada, the effect is most disastrous. In the larger towns, the trouble has not been experienced to so great an extent.

In this country, although a few rural companies have complained of a temporary falling off in consumption, yet on an average there has been a steady increase. There are some companies in certain localities whose consumption has been materially reduced, but, we are pleased to say that we believe such cases to be few. We have heard gas engineers relate that numbers of their smaller consumers, after having purchased lamps, and burned kerosene oil for a while, have returned to the use of gas—having become satisfied from their experience with the two illuminating agents, that, relatively, when the essential items of safety, freedom from trouble, and superiority of light were considered—that gas-light deserved the preference. In using lamps, all the trouble of filling, cleaning, trimming, replacing broken chimneys, smoking, &c., must be endured, while in the use of gas none of these troubles need be experienced. Consumers are soon taught this by experience, and hence their return to using gas.

Gas engineers, especially those in charge of country works, would gladly hail any reliable process for cheapening the production of coal-gas. A number of new inventions have been tried, but so far, few have been found to promote any real economy superior to that promoted by the old-fashioned way of carbonizing coal. That there is room for improvement none will deny, and such is the conviction of the need of some cheaper process than that now generally in use, that any new method of generating gas would receive from liberal minded engineers, a fair and impartial trial. Could a process of cheapening the cost of gas be immediately introduced, it might be the means of placing some of the Canadian companies on their feet again, and of resuscitating the value of their shares.

UTILIZATION OF SEWAGE.

The question of utilization of the sewage is still discussed by the English and Continental technical journals, and the wide range which these discussions have taken evinces the importance which is attributed to the subject. In this country, very little attention has been paid to the matter. As a general rule, it may be stated that our agriculturists are far less economical than their confreres in foreign lands, and as our soil is naturally of a more productive nature, or rather perhaps, not worn out by the cultivation of successive ages, as is the case in many parts of Europe, our farmers have not yet attained that degree of economical management which should lead them to husband most carefully the manures produced on their premises, but of these they are often wasteful, and consequently large quantities of concentrated manures are necessary to the successful cultivation of their lands. This wastefulness is not an attribute of our farmers alone; it is a characteristic of our whole population, for in nearly all things we lack that spirit of economy which is so closely observed in older countries.

It is this habitual extravagance which has led to such little interest being manifested in this country in the discussion of the sewage question. The same spirit, although less in degree, has been evinced until quite recently in Europe. A change has lately taken place there, however, and as we have said, the attention which the sewage question has elicited, is wide and general, and although eminent authorities have pronounced the utilization of sewage impracticable, yet the truth is being sought for by many experimenters.

The London *Sanitary Reporter*, in discussing the subject, very considerately asks—"What effect will the distribution of millions of tons of sewage, spread over an immense surface, have upon the health of the inhabitants of the neighboring districts?" A very pertinent question—especially in seasons such as that we are now experiencing, the thermometer standing, as we write, at 90° in the shade. The intense heat of the summer sun has a very powerful effect upon sewage, causing it to rapidly decay, and while undergoing decay, the most noxious gases are given off. It is considered essential to the health of a city, that the filth and garbage, and liquid sewage from the gutters be removed at once. If these matters be removed from the streets of the city to be placed upon the soil of the country, what is to hinder the deleterious gases and vapors from being as detrimental in the one place as the other? This is a question for the advocates of sewage manure to ponder. We close this article by quoting the following paragraph from the *Reporter*:

"A great deal of the influence of sewage on health will depend on the state of the atmosphere at different times, as it is believed that such diseases as typhus fever, measles, small-pox, and other epidemics which affect the rich and poor equally, are under the influence of atmospheric agency. Many persons know the effect of marsh miasma on the constitution. Now, although it is said that there is a perfect deodorization of sewage when spread on the ground, yet, as the actinic solar rays are those which, of all rays, alone possess chemical action, so may not that volatile matter alone of the sewage which passes off into the atmosphere, emitting no odor, eventually prove detrimental to health? Attention is called to this in further examination of the question before us as it has hitherto escaped observation. From such soils as those irrigated with sewage there will, always, be an evaporation going on, carrying with it, we conceive, disease-bearing particles, the consequence of which has not yet been arrived at. All moneyd interests, therefore, must be out of consideration on this subject."

SANITARY CONDITION OF NEW YORK CITY.

For almost the first time within the memory of the "oldest inhabitant," the streets of New York may be pronounced to be clean and pure. The gutters are freed from the disgusting mass of filth and garbage which formerly choked them up, and the pools of stagnant water, which until recently were seen in almost every thoroughfare, have disappeared. For all this the citizens of the metropolis are under lasting obligations to the new City Inspector, Ex-Alderman BOOLE. This gentleman, since his assumption of the arduous duties of his post, has personally visited the streets, lanes, and alleys of the city, and has wisely and energetically administered the duties of his office. The task which he undertook was one of gigantic proportions. It was one which had been attempted by many individuals before, but their successive attempts were succeeded by as many failures, until at last the streets of the city were in such a condition as to excite the gravest apprehensions, lest some epedemic might break out and decimate the population. Mr. BOOLE has effectually quieted such fears as these, and his thorough renovation of the city deserves to be mentioned in story and verse, and to be cited along with the narration of the exertions of HERCULES in cleaning the Augean stables. The old adage—"A new broom sweeps clean"—has been quoted in reference to Mr. BOOLE since the cleansing of the streets began in such good earnest; but we have had ample pledges from the Inspector that the work so efficiently entered upon shall be carried out to its minutest detail, so long as he shall continue to hold the office.

But while our citizens may congratulate themselves on the satisfactory condition of the streets, there is very much cause for serious inquiry as to the unprecedented rate of mortality. The number of deaths reported as having occurred in this city during last week, was *nine hundred and seventy!*—and this, too, at a time when thousands of the residents of New York are away at the wateringplaces and other summer resorts, and very few strangers are in the city. Had this excessive mortality occurred while the streets were in the filthy condition which characterized them a few weeks ago, the accumulation of offal and garbage would have been indicated as the cause. But now the streets are clean, and the cause lies clearly in another direction. The excessive heat of the weather has doubtless something to do with the alarming increase in the number of deaths, but other causes are at work which at present can be but conjectured. Here is a serious question for sanitary commissioners to decide, and we hope that Mr. BOOLE will lend all the influence of his responsible office to determine the matter. The welfare of a million human being depends upon the health of the city, and no more important subject for discussion exists.

A VISIT TO THE SEWERS OF LONDON.—On July 15th, a party of gentlemen, among whom were the Duke of Sutherland, Lord R. Grosvenor, Mr. J. Glaisher, Mr. Matthews, the engineer, Dr. Letheby, Medical Officer of Health of the city of London, and Mr. Haywood, engineer to the City Commissioners of Sewers, met together at the Guildhall, for the purpose of proceeding on a visit of inspection of the main sewers of the city of London. Having abandoned their ordinary garments, they assumed dresses similar to those worn by the 'longshoremen, consisting of the usual blue blouse, Guernsey jackets, thigh boots, and tarpaulin hats. From one o'clock until nearly five, the visitors pursued the course of the old London Bridge and Fleet sewers.

FINANCIAL.

Friday Evening, August 14, 1863.

Again we have to report an absolute dearth in transactions in gas shares. The intense heat of the past fortnight, and the absence of so many of our capitalists from the city, have conspired to prevent any extensive transactions. At the Broker's Board, no gas shares have been offered, and the attention of operators there has been confined to the ordinary railroad and bank stocks—the greater number of operations being confined to shares of the "fancy" denomination. We presume there will be very little movement in gas shares during the summer months. The holders of these securities are few in number, and so well are they satisfied of their value that they are seldom tempted to part with them.

We hear that the *Augusta and Hallowell*, Maine, gas company have passed their dividend. The cause is not stated.

One or two small gas-works in the vicinity of New York are offered for sale. Among these may be mentioned that at Hunters Point, on Long Island, opposite Thirty-fourth street. These works are said to be substantially built, and as the town which they light is an important suburb of the metropolis, their prospective value is great, even though they should not at once attract the notice of the capitalist.

ANSWERS TO CORRESPONDENTS.

J. W. B., of Mich.—*Your communication was received during our absence from the city, or your request would have been attended to sooner. Your remarks are well timed, and we hope you have overcome the difficulties you labored under when you commenced your task. It will take about four weeks for us to obtain the information, and we will notify you at once of the answer.*

A. C. J., of Pa.—*We have not a very favorable opinion of the coal, although it may do very well to mix with other coals, richer in bituminous matters. Its yield of gas is not very great, nor is the gas of a very high illuminating power. It is remarkably free from sulphur, when compared with other coals of a similar nature.*

P. F., Jr., of Me.—*We did not receive your first letter. We have but little to advise, but think your course, upon the whole, was justifiable. We do not know the lessee of the works.*

E. H. P., of Minn.—*Our tables are nearly perfect. We intend to publish them for some time yet, until we can call them perfect in every respect. Some alterations are made in every issue of the* JOURNAL. *These are trivial, it is true, and would hardly strike the eye of a casual reader, but they are essential to the perfection of the whole.*

L. E. H., of Ky.—*We have frequently recommended Hughes' as the best rudimentary work on the subject. We can obtain it for you if you desire.*

THE LAKE TUNNEL, AT CHICAGO, ILL.—We direct the especial attention of engineers to the advertisement of the Board of Public Works, of Chicago, asking for proposals for constructing the lake tunnel at that city. In another part of this paper we give an abstract of the report of the Board, in which some particulars are given as to the design of the Board in building the tunnel.

WATERTOWN, WIS.—The gas-works at this place are offered for sale. The company was organized under the laws of the State of Wisconsin, with a paid up capital, free from indebtedness, upon a foreclosure sale of the works and appurtenances of a former company, whose capital was $50,000. The works are substantially built of brick, with all the necessary apparatus for making gas sufficient for the city, with about three miles of street main. The consumers now number about 90 to 100, and some 40 to 50 street lamps, one half of them lighted. The original cost was $40,000. The works were built in 1856, and have been running since that time. Watertown contains about 6,000 inhabitants, and is the point of intersection of five railroads. It is situated on Rock river, with an unfailing water power, and is surrounded by a rich farming country. Gas of satisfactory quality is made from wood, with a slight mixture of coal. The holder is 40 feet in diameter and 12 feet deep, and in good condition.

THE PORTABLE GAS-WORKS AT PARIS.

Though the supply of portable gas in this country has proved a failure, it has been carried on in different parts of the continent with considerable success, and the Portable Gas Company at Paris has attained such an important position as to be noticed separately in *Les Grandes Usines de France*—a publication we have before referred to, devoted to the description of the principal manufactories of the empire. The works of the company are under the management of M. Hugon, and it will be interesting to our readers to learn the means adopted to bring this method of gas-lighting into practicable and profitable use. It is not, indeed, intended that portable gas should compete with the supply of coal-gas from mains and service-pipes, for it is admitted to be much more costly; but the circumstances in which it is peculiarly applicable are stated to be, where a bright light is required, with less heat than the combustion of ordinary gas produces, and for lighting the small villages in the environs of the capital, which lie beyond the limits of the mains of the Paris Gas Company. It is regarded as the pioneer of ordinary coal-gas, by introducing a brilliant light in the workshops and *cafes* of the outskirts of the city; and, as the French writer expresses it, thus "initiating the inhabitants to the advantages of adding many hours to pleasure and to work."

The material employed for making the gas is Boghead cannel, which is shipped from Scotland to Rouen or Dieppe, and thence is sent to Paris, either by boat or by railway, the cost of the carriage nearly doubling its original price. The Boghead is first broken into pieces about 2 inches square, and is then distilled in clay retorts, set nearly in the same manner as those used for the production of common coal-gas. The retorts are flat, being 5 inches high, 26 inches wide, and nearly 4 feet long; and they are fitted with mouth-pieces in the usual manner. They are set in benches of seven each, with a furnace in the middle, which is heated either with coke, or with the thick tar that is the first product of condensation. When the retorts are heated to a bright red, they are rapidly charged, and the distillation is conducted so quickly, that it is completed in about three-quarters of an hour. The products are carried off in the same manner as in manufacturing ordinary coal-gas, by a perpendicular ascension-pipe. The residual coke is withdrawn as quickly as possible, and the retorts are immediately charged again; but, during the interval, short as it may be, the cooling they undergo does them much injury.

In the Portable Gas Works as Charonne, described in *Les Grandes Usines de France*, the Boghead coke is generally used to pave the yard, for which purpose the tar with which it is impregnated renders it very suitable, and impervious to wet. The possible application of Boghead coke as a substitute for animal charcoal as a disinfector is alluded to; but it has not, in point of fact, been yet turned to any more profitable use than for macadamizing roads. The deposition of graphite in the retorts is removed by burning it, to effect which a blast of air is introduced through a fire-clay tube, while the retorts are red hot, and a communication is made between the mouth of the retort and the chimney.

The products of distillation, after the heavier portions of the tar have been deposited in the horizontal main and in the tar-pit, are passed through condensers, wherein the lighter oils are deposited; and the gas, after passing through a series of long tubes exposed to the atmosphere, is conducted to dry lime purifiers, and thence to the gas-holders. The gas-holders are very much smaller than those of ordinary gas-works; for the gas, as it enters, is withdrawn by twelve pumps, which force it into receivers, fixed in the vans that convey the gas to the consumers. The vans are made on the company's works; they are supported by springs on a solid frame-work of wood, each one being about 10 feet long and 6 feet 8 inches wide. Nine cylinders made of plate iron, of the same length as the van, and 16 inches in diameter, each one being capable of holding 25 cubic feet of gas at the pressure of the atmosphere, are fixed in the van. As the cylinders are intended to hold gas compressed to eleven atmospheres, they are necessarily required to be very strong. They all communicate, through bent copper tubes, furnished with stop-cocks, with a brass pipe, that has a pressure-gauge attached to it. When the receivers are to be charged, the van is brought near the pumps, and, the stop-cocks being opened, the gas is forced in until the pressure-gauge indicates eleven atmospheres. To warn the workmen, in case the pumps should exhaust the gas-holders, a small bell is attached to a movable horizontal axis, and is supported in its position by the pressure of the gas in the gas-holder; so that, when the pressure is removed it falls down, and, by its sound, tells them to stop pumping.

At a pressure of eight atmospheres, a portion of the hydrocarbons in the gas condense, and form a liquid. The quantity thus deposited averages about 100 grammes in each cubic metre of gas 46 English grains per cubic foot; and it is much greater in winter than in summer. In the early progress of the works this condensation was a serious obstacle, but it is now converted into a source of profit. The light condensed oils are collected through tubes in a reservoir, from which they are pumped into a distilling apparatus heated by steam. By this means an extremely volatile hydrocarbon is produced, that is well adapted for naphthalizing gas, or for other purposes. It is by the skilful utilization of this and the other sub-products that the Portable Gas Company at Paris has become a successful undertaking.

When the nine cylinders in each van are fully charged they contain about 2,250 cubic feet of compressed gas. The vans, drawn by two horses each, are towards evening taken to the places to be supplied. The consumers cylinders, that serve as reservoirs for the gas, are usually placed at the tops of the houses, each one being about 6 feet 8 inches long and 2 feet in diameter, and made sufficiently strong to bear a pressure of five atmospheres. They are charged with gas from the cylinders in the van, through India-rubber tubes, fitted with appropriate connecting-screws. From those reservoirs the gas is distributed to all parts of the house, after having passed through a regulator and through a meter. The number of consumers now supplied in this manner amounts to nearly 1,200, who are distributed over 85 communes; and 84 horses are employed in conveying the gas. It is estimated that, for 29 centimes, the light thus supplied is equal to the illuminating power of one cubic metre of the gas of the standard of the Paris Gas Company, the charge for which is 30 centimes.

Many attempts have been made in France to apply portable gas to the lighting of railway carriages; and M. Hugon has, it is said, overcome the difficulty arising from the oscillation of the flame by the vibration of the carriages, by causing the gas to pass thaough a box before it reaches the burner, which gives steadiness to the flame. In an experiment made by him on the 11th of December last, between Strasburgh and Paris, the gas continued to burn for 13 hours, the rate of consumption being 0.38 cubic feet per lamp per hour, at the cost of about 4*d.* for 12 hours for a brilliant light. Some of the railway carriages at Brussels, Moscow, Bordeoux, Orleans, Namur, and Barcelona, are at present lighted with portable gas, and it is said to answer very well. In concluding the notice of the Portable Gas-Works at Paris, it is predicted by the French author that, with the present rapid progress of industrial arts, portable gas will be developed in an equal degree with ordinary gas-lighting; and that, without coming into competition with the latter, which is regarded as impossible, it may add greatly to the general welfare and to the promotion of industry.—*English paper.*

ABSORPTION OF HEAT BY GASES.—In a paper recently read before the Royal Institution, London, by John Tyndall, F. R. S., relating to his researches on the radiation and absorption of heat by gaseous matter, he stated that olefiant gas absorbed more radient heat than all the other gases experimented with. A layer of olefiant gas two inches in thickness absorbed about 30 per cent. of the entire radiated heat. If a layer of the gas, two inches in depth, surrounded the earth, it would offer no appreciable hindrance to the solar rays in their earthward course; but it would intercept 30 per cent. of the terrestrial radiation, and the earth would be raised to a stifling temperature.

WATER-WORKS OF AMERICA.

CHICAGO, ILL.

We have received the report of the Board of Public Works of Chicago for the fifteen months ending the first of April, as required by the provisions of the revised city charter.

Concerning the operations of the water-works, it is stated that no large additions to the works have been made during the period covered by the report, other than in laying down distributing mains. Of these, 50,881 feet, or 9 3361-5280 miles, of 4, 6, and 8 inches diameter, have been laid down, the amount in the three divisions of the city being as follows, viz.:

South Division	11,426 feet.
West " "	26,271 "
North "	13,184 "
	50,881 feet.

The whole amount of distributing mains now in connection with the works is 98 miles and 2,648 feet. The supply mains, not included in the above, are in length 6 miles and 2,247 feet, making the whole amount of pipes laid in the city, of all sizes, 104 miles and 4,890 feet.

COST OF THE WATER-WORKS.

The Water-Works had cost, at the first of the present month (April)	$1,118,494 90
There have been issued six per cent. water-loan bonds, amounting to $1,030,000, which were generally sold at their seven per cent. par value. Deducting, for the discount thus made, $82,235 41	947,764 59
Seven per cent. water-loan bonds sold at par	103,000 00
Balance derived from water-rents	67,730 38
	$1,118,494 97

INCOME OF THE WATER-WORKS.

Water-rents received from January 1, 1862, to March 31, 1863, inclusive	$188,448 28
Profits tapping pipes	846 52
Total income for fifteen months	$189,294 80

EXPENSES AND REPAIRS OF WATER-WORKS.

Interest on water loan bonds	$71,306 77
Expenses at pumping works for 15 months, as above	20,471 16
Miscellaneous repairs, including new inlet-house, and dredging basin	9,649 26
Miscellaneous operating expenses	21,187 32
Total for the fifteen months	$122,614 51
Besides the above, there were expended by the Board in laying distributing mains	$89,197 17
Making other permanent additions to the works	5,031 44

QUALITY OF THE WATER.

Last spring, at the time of the spring freshet, the accumulations which had gathered in the river, and under the ice, during the winter, were suddenly discharged into the lake, and, by the southerly winds that then prevailed, were forced along the lake shore, north of the river, for a long distance, rendering the water very bad for three or four days. Since that time there has been little cause for serious complaint. The water has been good, with but one or two exceptions.

The opinion was expressed in the last report, or that for the year 1861, that measures then proposed would, when carried out, rid the water of the small fish which were then so abundant as to make the water in some localities very offensive, and caused more complaint as to the quality of the water than anything else. It was only at the beginning of last winter that the new inlet house, the proposed means to exclude the fish, was got into use; and since then they have been kept out of the pipes. They have been kept out, however, only through constant watching day and night, and cleansing and maintaining in good order the various screens through which the water passes At the mouth of the inlet, the water has swarmed with them all winter long.

The Board have not been idle during the year in regard to the measures to be taken for permanently bettering the quality of the water, so that it shall not be liable to be reached by any of those influences which now occasionally injuriously affect it, and in particular that it may be secure from the discharge from the river. During the year, the subject has been under continual examination and discussion, and such surveys have been made as have seemed necessary.

It will be apparent that a change in the supply of water to be furnished to the city, whether it be effected by erecting pumping works in another locality, or by conveying water from another part of the lake to the present pumping works, cannot be effected by any work of small cost. The change will require a good deal of time and money.

PROPOSED PLANS FOR IMPROVING THE QUALITY OF THE WATER.

In discussing the various projects which have been examined for improving the supply of water, the Board have come to the following conclusion:

That what is most to be desired by the city is, that the supply should be drawn from the deep water of the lake, two miles out from the present Water-Works, where the water is subject to no impurities, except occasionally the slight milkiness which the lake has after a long continued northeast blow, and where it is clearer and cooler in summer than in shallower waters, and where also the lake is not affected by the discharge from the river, as it is during an unusual freshet along shore for several miles, north and south of the harbor.

It is very generally admitted by the citizens, that water obtained at a distance from the shore would be purer and better than could be had otherwise, but the difficulties which attend the making and maintaining of a conduit running two miles out into the lake have been thought to be so great, that there is a general apprehension that while it is very desirable that the supply should be so obtained, it is not possible within any reasonable limits of expense.

Upon a careful investigation of the subject the Board have come to the conclusion that it is practicable to extend a tunnel of five feet diameter the required distance under the bed of the lake, the mouth or inlet to such a conduit being the outmost shaft, protected by a pier, which will be used in the construction of the tunnel. All soundings and excavations show that underlying the site of the city, and under the lake, is a stratum of clay of great thickness. It is believed that in this clay a tunnel of the size proposed can be constructed without serious difficulty.

The most difficult operation connected with its construction the Board believe to be the placing of the piers as proposed, at each half mile from the shore, within which shall be sunk cast-iron shafts, from which the tunnel shall be worked either way, towards and from the shore. Work of this character is very troublesome, and is liable to more or less partial failures. The experience in regard to such constructions on the lake is, however, very considerable, and sufficient to induce the hope that the piers can be built and maintained while the tunnel is being constructed, and within reasonable limits of expense.

The only doubts about the feasibility of the tunnel grow out of the question as to the practicability of *building the piers*, and of maintaining them exposed to the violence of the lake storms as long as will be necessary in the construction of the tunnel.

At the time of the freshet already referred to, when the water was so foul, a great many observations were made by the Board, especially to determine how far in various directions the river discharge affected the lake water. Along the lake shore and for five miles north of the Water-Works its effect was very marked—the water was almost as impure as abreast of the city. Its influence was felt along shore much more than five miles, but its northern limit was not determined. Southward, some three miles from the mouth of the river, similar observations were made near the shore, showing the water to be impure there also, but better than it was along the lake shore the same distance north of the mouth of the river. At the same time observations were made running out from the pumping works into the deep water of the lake for several miles distance from the shore. At the distance of one mile from the shore, no trace by taste, smell, or appearance could be detected of the effect of the discharge from the river. The water was there apparently quite pure, and so continued as the distance increased from the lake shore.

Since these observations were made, the effect of the river on the lake water has at no time been very marked, and no good opportunity has occurred of renewing them, but the river was in an extremely offensive state when the freshet came, from having lain nearly stagnant and covered with ice, and gathering filth all winter long, and it was forced at once in a mass into the lake. From these and other circumstances attending the freshet, its effect on the water of the lake was greater than was ever known before. It is safe to conclude, that the water of the lake is not likely ever to be acted on by the river much more than a mile out from the shore, and that at that distance from the shore there is much greater security from the contamination of the river, than along the lake shore, for several miles, both north and south of the river.

It will be well perhaps to remark here, that the turbidness which the water supplied by the works has during much of the spring, and occasionally during the year, does not arise from any mixture of the river with lake water. It might almost be said that it is never more likely to be free from it than when having this appearance. The water of the lake always has this turbid, milky appearance after agitation by winds, especially by northeasterly winds; and for miles out from the shore the lake will be found more or less discolored, becoming not clear even at the distance of five miles from the shore. It arises from the action of the waves on the clay and gravel banks bordering the lake to the north. This is not supposed to be injurious, and the water, at the distance of two miles from the shore, will have very much less of it than the water near the shore.

Recently observations were made during the prevalence of easterly winds, when the waters of the lake were turbid, at Winnetka, fifteen miles north of Chicago, and at the same time at the pumping works. Specimens of the water were taken at the shore, at both localities, and at half-mile distances out for five miles. The Winnetka water was apparently a little more turbid than the water off the pumping works; otherwise there was no perceptible difference in the specimens taken. This increased turbidness of the Winnetka water was owing, doubtless, to the fact that there the lake washes against banks of clay, and here against shores of sand and gravel.

The estimated cost of the tunnel, extending two miles out into the lake from the pumping works, is $307,552. This estimate does not include, however, any provision for a light-house, which it will be necessary to place on the outside pier, if it be allowed to remain above or near the surface of the lake after the tunnel is built.

One other project which has been discussed is, to make along the lake shore, some five miles north of the present pumping works, a large, natural filtering or settling basin, from which the water shall be conveyed to the works by a five-foot brick aqueduct. For settling and freeing the water from sediment, the basin would be found effective, and would continue to be so, but that for filtration it is not safe to rely upon it. There have been filtering basins of this character in other places. Some of them appear to have continued to work well during long use, and others have failed and become useless.

The greatest objection to this project is, that the water will be taken along the lake shore, where it will not be as good as that taken from where the lake is deeper. The river discharge a year ago followed along the lake shore more than five miles, and its presence was very noticeable; neither settling nor filtration would remove the taste of it. The cost of this basin and aqueduct is estimated at $300,575.

It has been suggested, too, that instead of tunneling under the lake abreast of the city, it will be safer to get away a greater distance from the mouth of the river, and that starting from the proposed location of the basin spoken of above, and in place of it a tunnel be run out under the lake as far as may be thought necessary, and an inlet at the shore be also made, the water to be conveyed by a brick aqueduct to the present pumping works. The estimated cost of five miles of aqueduct of a diameter of five feet, and one mile of tunnel of the same size, with an inlet-pipe and gate-house, so that the water can be taken by an inlet near the shore or through a tunnel from the deep water, as may be preferred, is $380,000.

WATER METERS.

The Board have found it advantageous to increase the number of meters, and believe that their use is satisfactory generally to the parties whose rates are determined by them, as well as to the Board. There are now on hand seventy-six water meters, all of the Worthington patent, and there have been ordered twenty-three more. The water rates determined by meter

during 1862 and the first quarter of 1863, amount to between $17,000 and $18,000.

PIPE CONTRACTED FOR.

The Board, late last season, agreed with Messrs. R. D. Wood & Co., of Philadelphia, for the delivery of 700 tons of four, six, and eight-inch pipes as soon as practicable after the opening of navigation—300 tons at the price of $41, and 400 tons at the price of $46 50 per ton of 2,000 lbs.

CHICAGO RIVER.

Much attention has been given by the Board to the means to be adopted for purifying the river. The cleansing or flushing of the river by the introduction of lake water in large quantities by communications connecting the lake with the North and South Branches, is apparently the best of the various methods suggested, and there is no doubt that the river could be kept comparatively pure, and so that it would never become offensive. It is recommended that the first work to be undertaken be an aqueduct, to be made through North street, connecting the lake with the river, and that the necessary machinery be erected for pumping the lake water into the river in such quantity as to change the water between North street and the mouth of the river once in twenty-four hours, when necessary.

The proposed aqueduct will be circular in form, twelve feet in diameter, and covered, the top of it being several feet below the level of the lake. The pumping machinery can be arranged to pump both from the lake into the river, and from the river into the lake.

It is believed that the water to be forced through this canal will keep sufficiently pure all of the main river, and all of the South Branch between the main river and North street. The North Branch and that part of the South Branch south of North street, may not be materially benefitted by it. If it is found to work well, a similar construction can afterwards be made for flushing out the North Branch.

It is proper to remark, that while it is probably true that the beneficial effects of the North street canal will not be felt beyond the district named, it will nevertheless remove all *sewerage* matter discharged into the river. Every sewer outlet on the river or its branches is along the main river and the South Branch north of North street. Whatever of filth is generated in the South Branch south of North street, and in the North Branch, by slaughtering establishments, distillers, etc., is made in defiance of the city ordinances.

The estimated cost of the covered brick aqueduct, with its pumping machinery complete, is	$140,000
There will be an estimated annual expense connected with the machinery, for coal, services of engineer, fireman, etc., and for repairs, of	7,500

These two works—that suggested for improving the supply of water to the city, and this last for purifying Chicago River from its mouth to North street—are presented for the consideration of the Common Council of Chicago. If the plan meets with their approval, it is recommended that an ordinance be passed authorizing the Board to take immediate steps for their construction.

SEWERAGE WORKS.

15,685 feet, or about three miles, of sewers were built during 1862, making now the whole amount of public sewers laid, 57 1128-5280 miles. The sewers built last year were generally brick sewers, more than half the amount being of sewers of 4½ feet diameter.

The cleansing of the sewers for the fifteen months ending April 1, 1863, cost	$4,897 24
The repairs of the sewers for the same period cost	3,024 07

The balance of account in the last report, stated to be due from S. Lind, Treasurer of the late Sewerage Board, has not yet been paid. The amount now charged to him is $108,696 53.

By the late charter amendments an additional issue of sewerage bonds of $500,000 was authorized.

The following particulars are taken from the report of E. S Chesbrough, Esq., City Engineer of Chicago:

THE PUMPING ENGINES

Have been in operation the past year 6,152 51-60 hours, being an average of nearly 17 hours each day throughout the year, during which time they have made 3,369,071 revolutions, delivering 2,217,279,739 U. S. gallons of water, being an increase over the quantity pumped in 1862, of 450,125,050 gallons. Of the whole quantity,

The large engine pumped	1,288,812,432 galls.
The small engine pumped	928,467,307 "
Total	2,217,279,739 "
Being an average daily quantity of	6,074,739 "

The coal consumed for this purpose amounts to 2,748 1211-2000 tons. In addition to the above amount of coal, 138 1350-2000 tons was consumed for maintaining the fires when the engines were at rest. There has also been consumed for pipe laying, work-shop, heating engine-house, etc., 82 1650-2000 tons, making the whole amount of coal used for all purposes, 2,970 211-2000 tons.

The following table will show the quantity of water pumped each month from 1858 to 1862, inclusive:

Months.	1858.	1859.	1860.	1861.	1862.
January	81,538,179	106,905,665	132,284,454	137,651,918	151,971,047
February	69,436,515	106,401,412	130,506,720	142,071,067	168,361,783
March	82,677,463	102,415,983	150,331,630	135,576,447	192,937,942
April	82,600,782	89,994,235	133,030,546	128,371,178	170,081,570
May	82,279,920	116,007,263	141,171,078	150,489,168	181,489,092
June	90,211,505	113,098,416	148,197,024	155,996,352	199,113,518
July	101,670,736	133,509,336	166,394,640	147,182,793	209,215,872
August	107,176,652	123,266,556	152,427,690	165,602,494	195,583,295
September	108,534,540	131,735,847	132,272,202	152,710,186	186,902,883
October	101,946,605	141,527,040	148,710,195	149,362,166	199,045,045
November	86,385,840	127,342,018	150,498,248	153,879,648	187,002,720
December	93,316,722	122,053,129	130,773,075	145,261,272	175,006,027
Totals	1,091,585,457	1,415,147,910	1,710,786,552	1,767,154,659	2,217,279,739

The average daily quantity pumped for the above years was:

1858	2,991,412 galls.
1859	3,877,118 "
1860	4,703,525 "
1861	4,841,547 "
1862	6,074,739 "

The supply of water the past year has been uninterrupted, with two exceptions—on the 24th of April, about 4½ hours, at night, for the purpose of cleaning out the pump well, and on the 25th of September, when it was found necessary to refit one of the steam "stop-valves," requiring about five hours time, also at night. In each of these cases the reservoirs were full, and watchmen were stationed at each to let on the water in the event of a fire occurring.

Neither the engines nor boilers have received any extensive repairs the past year, those of any importance being the "stop valves" alluded to above, and the repairs done to the "delivery valves" of the large engine. In addition to the above, the engines have been painted and varnished, the labor of which was done by the engineers, the general appearance of the engines being greatly improved.

RESERVOIRS.

During the year 1862 the three reservoirs were all in uninterrupted use, except for about a day with each, when it was necessary to cleanse them.

The south reservoir continued to leak so much as to render further repairs necessary. These repairs have been made for a short time, and appear to be effectual. They consist in five coatings of roofing composition, and four of felting, on the bottom of the reservoir. Over this a layer of three inches of concrete was carefully placed. The bottom of the reservoir was thoroughly keyed up on the beams and other supports. Of course it is too soon yet to judge of the durability of these repairs, but their success so far is very encouraging.

The north reservoir is in very good order. The west one leaks more than it did a year ago, but not sufficient to do any injury yet; it should, however, be caulked in the spring.

A few hundred dollars expended in improving the grounds around these reservoirs would add very much to their external appearance.

QUALITY OF THE WATER.

The quality of the water has been bad several times since the date of the last report. At the breaking up of the ice last spring, the discharge from the river was accompanied by a southerly wind, and was carried in front of the pumping works. The taste of the water for several days was exceedingly disagreeable. During the summer, complaints of bad water were comparatively few. In the autumn, soon after the packing season commenced, the offensive state of the river returned and the water supplied to the city was evidently affected by it during protracted southerly winds. Since the Calumet feeder has been discharged into the canal, and thence into the South Branch, the river has been far less offensive than before, and complaints of bad water have been rare. Perhaps this exemption from annoyance for so long a time has been owing more to the great amount of rain and melted snow discharged into the branches of the river than to any other cause.

The "*fish nuisance*" has been entirely abated since December, by means of the new inlet-house, constructed for that purpose. By constantly watching, and daily cleansing the screens in this house, it is believed exemption may be enjoyed from what was so offensive a year ago. There is no diminution of the fish, however, outside of the screens; for they appear sometimes to be more numerous than ever.

PLANS FOR GETTING BETTER WATER.

The evil with regard to the water has become such as to demand some remedy, as soon as an adequate one can be applied. The various schemes that have been proposed to effect this object having been discussed in previous reports, it is not thought necessary to go into detail now concerning any of them, except those which are to take the water from about two miles east of the pumping works, where the lake is supposed never to be affected by impurities from the river; or from a point about five miles northward on the lake shore, where impurities from the river very rarely have any perceptible influence.

Other projects, such as erecting new pumping works at Winnetka, or going to Crystal Lake and bringing a supply thence by simple gravitation, as is done for the cities of New York, Boston, Baltimore, and Albany, have been considered, but their great cost, as compared with that of obtaining an abundant supply of good and wholesome water at points much nearer the city, is deemed a sufficient apology for not discussing their details here.

The cost of iron pipes alone to Winnetka, according to the estimate on page 34 of the report of the late Water Commissioners, dated Jan. 1, 1861, would be $1,689,600; but if the present high prices of iron should continue, this amount would be insufficient.

The cost of iron pipes to Crystal Lake, supposing the size the same as proposed to Winnetka, three feet diameter, would be upwards of $5,000,000. Suppose, however, by expending $500,000 at present for a reservoir that might be sufficient for a few years, the second line of pipe might be omitted for eight or ten years, there would remain the necessity for a present expenditure of more than $3,000 000 for items that do not include land and water rights, and the expensive excavation that would be necessary in getting out of the basin of the lake. At the end of a few years, probably not more than ten, the second line of pipe would be necessary, involving an expenditure of nearly $3,000,000 more.

Of the plans proposed for obtaining water from the lake, [illegible] it will be free from not only the wash of the shore, but from the effects of the river, two classes only have been considered: one, an *iron pipe, with flexible joints;* and the other, *a tunnel under the bottom of the lake.* A great many suggestions have been made with regard to the kind of iron-pipe that should be adopted, and the mode of laying it; but the one considered and estimated upon in the report of the late Water Commissioners, for January 1, 1861—see pp. 26 to 32—may be regarded as a type of the whole, at least as economical as any. In the report mentioned, the suggestion was to extend a pipe but one mile into the lake; but observations made last winter and spring show that the water for the city should be taken from a point *two* miles out; because the bad taste was found at one time to extend about a mile from the shore, and

therefore to be out of the reach of danger, a point two miles out should be attained.

It should be here stated that actual observations since 1861 show that the following opinion expressed in the report for the 1st of January of that year was not correct: "Impurities from the river would be more likely to affect the water a mile out from the pumping station than near the shore, because the prevailing winds are from the northeast, and the currents of this side of the lake strongly southward, as the character of the newly-formed beach north of the pier shows." This error was induced by a study of the formation of the beaches and bars in front of the city. Since, however, there has been an opportunity of studying the offensive discharges from the river as they occurred about a year ago, on so large a scale, it has been ascertained that they mingle so completely with the lake as to be scarcely traceable a mile out, and are carried northward or southward, parallel with the shore, according to the direction of the wind or current in the lake. Generally, discharges from the river are accompanied by southerly winds, and consequently by a northerly current in the lake. The winds and currents, however, are not always in the same direction, as was noticed by some of the earliest French missionaries to this part of the country, much to their surprise.

Estimating then for a pipe two miles long, and allowing for the different items the present prices for materials and labor, the cost would probably be as follows:

10,560 lineal feet of pipe, weight 184 lbs. per foot, or 1,943,040 lbs., at 10 cents	$194,304
10 joints, at $500	3,000
Bulkhead	2,250
Laying the pipe	15,000
	$214,554

Thus far the items are those of the gentleman who proposed the pipe, except that the prices have been changed to suit the present state of things, and the length of the pipe doubled, for reasons already given. For reasons mentioned in the report for January 1, 1861, a liberal addition should be made to the above estimate for unforeseen contingencies, so that if it should be increased to $250,000, it might then be considered moderate. In consequence of the possibility of such a pipe being injured, by anchors, by the sinking of a heavily loaded vessel over it, or by the effect of an unusual current in the lake moving it from its place, it has been thought preferable to attempt the construction of a tunnel under the bottom of the lake.

LAKE TUNNEL.

The subject of tunneling under the lake to a point two miles out, has received much consideration from the fact that it would not only furnish equally as good water as the pipe would, but could probably be more easily made, considering the circumstances, than is generally supposed.

It is known from artesian borings on the lake shore, at Lill & Diversey's brewery, that about 20 feet below the surface, a clay formation commences, which continues upwards of 100 feet further. The bottom of the lake, where the water is more than 25 feet deep, is clay. Should this clay be continuous, and free from beds of sand, it would be very easy to make a tunnel large enough to supply the city for many years.

In order to make such a tunnel, it would be necessary to sink several shafts in the lake. The probability is, that four would be sufficient to insure the completion of the work in two years from the time of its commencement. It is proposed to do this by sinking octagonal cribs 80 feet in diameter, with central spaces 30 feet in diameter, leaving an average of 25 feet thickness to the crib around the shaft. In the central space, protected by the crib from the action of the waves, it is proposed to sink iron cylinders 9 feet in diameter, by the pneumatic process which has been so successfully practiced in driving the hollow cast-iron piles or piers for the Theiss bridge in Hungary, and the railroad bridge across the Savannah river, near Savannah, in this country, and recently the Harlem bridge in New York. The outmost shaft would be constructed with reference to its becoming the inlet for the water or gate-chamber, and perhaps be surmounted with a small light-house. The other shafts might either be surmounted with light-houses or be removed, together with their surrounding cribs, to such a depth as not to interfere with navigation. They could be constructed with reference to such a removal, and to a restoration, should future necessities require it.

Such being the outline of the tunnel project, before entering into its details it may be well to consider some of the objections that naturally arise on the first presentation of the subject. Those who have become at all acquainted with works of this kind, at once think of the Thames tunnel, of the appalling difficulties encountered, and the enormous expense incurred in its construction. A careful study, however, of certain well known facts in relation to that extraordinary work will furnish much more encouragement than would at first be supposed. That tunnel required an excavation 38 feet wide, perfectly flat on top, through an unusually treacherous soil, and only about 14 feet below the bottom of the river, which, at high tide, was about 32 feet deep, while ours would require an excavation but 6½ to 7 feet, circular in form, through a soil much more favorable, as we have strong reason to believe, and at a depth of 10, 20, 30, or more feet below the bottom of the lake as may be found advisable after sinking the shafts and making experimental drifts. Each running foot of the Thames tunnel cost an average of a little less than $1 900. The sectional area of the Thames tunnel, including masonry and excavation, is about twenty-three times as large as a 5-foot one here would be. As experience shows that small tunnels in troublesome earthy soils do not generally cost any more in proportion to their sectional areas than large ones, if as much, ours, estimated on the basis of the Thames tunnel, ought not to cost more than $83 a running foot, or, for two miles, $876,480—a sum which certainly would not appear unreasonably large, provided an equally good supply could not be got for much less.

Another objection which presents itself to the construction of a tunnel is, the difficulty to be met with in the sinking and maintaining of the cribs, and consequently of constructing and preserving in working order the shafts in the lake. This objection, if past experience here with regard to lake operations for the Water-Works is taken as a guide, is by no means a trifling one. The unsuccessful attempts heretofore to sink and put into place a short piece of pipe on the lake shore, have a very discouraging effect when it is proposed to attempt the same thing on a much larger and more difficult scale. But as the question now is relative to the sinking and maintaining of the proposed cribs, other sources must be looked to for experience and instruction. Fortunately, there is a large amount near at hand. The extensive operations of the national government in the construction of piers and breakwaters on the lakes, as described in the reports of Col. J. D. Graham, and the miles of breakwater constructed and maintained by the Illinois Central Railroad Company along our city front, furnish very satisfactory evidence that such structures can be erected and maintained along our lake shore, and at known prices. The opinion of experienced men is, that a circular crib with nearly perpendicular sides and a base sufficiently large could be made to stand more easily out in deep water than in shallow water near the shore. The reason for this is very plain, as one or two well-known facts will show. In deep water, while the form of the wave moves in the direction the wind started it, the water itself has no motion except up and down, as may be seen by the movements of vessels and aquatic birds on the waves; but as you approach the shore or shallow water, not only the forms of the waves but the water itself has a forward motion, the shallower the more rapid; hence the great danger of a vessel approaching too near such places in stormy weather.

It is proposed to construct the cribs in still water, plank their bottoms and sides water-tight, for several feet up, fill them with as much stone as they can safely carry, then tow them, when the surface of the lake is quiet, to their places and sink them, by letting water into their bottoms, and then to fill them up, as promptly as possible, to their tops with stones previously provided.

The pneumatic process for sinking the shafts is recommended, because it is believed the operation could thus be more certainly performed, and troublesome leakage more easily avoided, than by constructing coffer-dams inside of the cribs. But by either process the end could no doubt be attained if, as soundings already show, the bottom of the lake is [hard] clay.

A diameter of only 5 feet has been suggested for the tunnel, partly to make it in capacity just equal to the proposed flexible pipe, and partly to avoid the risks and uncertainties attending the construction of larger tunnels in troublesome earthy soils. This latter point cannot be better illustrated than by quoting the language of M. Minard in his work on construction. After speaking of the great difficulties met with in constructing several large tunnels, and pointing out the methods by which they were overcome, M. Minard says (pp. 284, 285):

"The success of the general processes just pointed out, principally the lateral drift, is based, I repeat, upon the great difference there is between making a drift 4½ feet or 4 6-7 feet in width and opening a tunnel of several yards; numerous experiments prove this difference.

"In the clay of Vaurigard, drifts were made which stood well as long as they had a width of not more than 4½ feet.

"When the small feeder tunnel of Torcy was commenced in detached masses of sandstone of moderate side, it was very easy to give it a width of 5½ feet, but when the attempt was made to increase this width to 8½ feet masses were detached, the supports bent and broko, and caves extending 65 to 80 feet occurred.

"In the chalk, full of fissures, at Saint Quentin, drifts 4½ feet were easily excavated, without supports, where it was impossible to give them a width of 10 feet.

"In the clay of Roubaix a number of drifts were made, 6½ feet in width; but this dimension could be exceeded but slightly without exposure to serious accidents."

In estimating the probable cost of such a tunnel various items must be assumed, for the prices of labor and materials are seldom the same exactly during two consecutive seasons; in fact, they often change materially in one. The character of the soil through which the tunnel is to be made, as it regards the difficulties to be overcome, can only be fully ascertained by the actual carrying out of the work, though much may, no doubt, be ascertained by preliminary borings.

There is good reason to believe that nothing in the soil would be more difficult than that through which the sewers of London are sometimes tunneled. M. Bazalgette, the Engineer of the Metropolitan Board of Works, in 1856, estimated the excavation of tunnels for sewers to cost on an average, including all expenses of raising the earth to the surface and carting away the surplus, supporting the top and sides till the masonry was built, and restoring water and gas-pipes and paving, at three English shillings, or say 75 cents a cubic yard. The same year he estimated for several much larger tunnels in the same city at twice the rate, or say $1 50 per cubic yard. These estimates are based upon the actual experience of a city which has probably had more to do with this kind of work than any other city in the world. But, to allow for our extra hauling underground, the proposed average in the tunnel being an eighth of a mile, and taking into account the difference of prices in the two countries, the cost per cubic yard for our tunnel will be estimated at $3.

The cost for brick masonry per cubic yard, in the English sewer tunnels appears to average from $5 58 to $6 75. In the tunnels on the Boston Water-Works it averaged $14 57. In the estimated cost of 1861 for the proposed tunnel here, $15 per cubic yard was allowed for this item; but as that was for a 6-foot opening, with 12 inches in thickness of masonry around it, and this is only 5 feet opening with 8 inches of masonry around, and as prices of labor and materials may continue high, $20 per cubic yard will be allowed in the present estimate.

The next item to be considered is the cribs. It is evident that an octagonal crib 80 feet in outside diameter, with a central space of 30 feet, leaving the solid portion 25 feet thick, would be very much stronger, and better calculated to resist the action of storms, than cribs of the same width and construction placed in a straight line; but it is proposed to construct ours in the same manner as those of the Government.

Col. Graham estimated the cost of a crib 30 feet long, 30 feet wide, and 32 feet high (for the proposed break-

water at Michigan City), p. 352 of his report for 1856, as follows, viz.:

For 6,210 lineal feet of white oak timber, hewn, one foot square, at 22 cents per lineal foot	$1,366 20
For 2,160 feet, board measure, of white oak plank, 3 inches thick, for flooring, at $20 per M	43 20
For 8,060 pounds of round wrought iron, for bolts, 1¼ inches diameter, at 4 cents per pound	322 40
For 164 pounds of wrought-iron spikes, ⅝ by ⅝ inches square, pointed and headed, at 7¼ cents per pound	12 80
For 176 cords of hard boulder stone, for crib ballast, at $10 per cord	1,760 00
Estimated cost of materials for one crib	$3,504 10
For carpentry, labor, superintendence, etc	1,250 00
Add 10 per cent. for contingencies	475 40
Estimated cost of one crib	$5,229 50

Which, for 28,800 cubic feet, would be 18 16-100 cents, very nearly, per cubic foot.

We must here conclude our notice of this important work, as our space precludes our entering more largely into it. We hope to speedily announce the completion of some plan by which the difficulties of the people of Chicago may be overcome, and a full supply of pure water obtained for that important city.

WATER COMPANIES OF LONDON.

"And the rest of the acts of Hezekiah, and all his might, and how he made a pool, and a conduit, and brought water into the city, are they not writtten in the books of the chronicles of the Kings of Judah?"—*Kings* ii. 20.

"This same Hezekiah also stopped the upper water course of Gihon, and brought it straight down to the west side of the city of David."—*Chronicles* ii. 30.

We might cite many instances, besides the above, from other writers of antiquity, to prove in what high estimation a good supply of water to a city was held; and from the same sources we also might show that the first object of a nomadic tribe has always necessarily been, and still is, to settle for the time being on a spot affording good water. These facts clearly point out that the habits and necessities of man have always been the same as in our own times. It would be easy to enter into all that has been adduced in respect to the canals or water courses, which were constructed, either to serve the purpose of irrigation or of commerce, by the ancient Egyptians; but as it is the fashion at present not to trouble ourselves so much respecting what *has* been done, as what is *now* doing, we will leave Aristotle, Pliny, Strabo, Herodotus and Diodorus, who tell us all they knew about the matter, and pass at once to the water companies of London, and first,

THE NEW RIVER COMPANY.

From "Maitland's History of London, 1739," page 629, "By the time the river was brought into the neighborhood of Enfield, the undertaker's fortune being nearly exhausted, and the city of London unwilling to engage in the undertaking, King James, by indenture under the great seal between him and Middleton, dated May 2d, 1612, covenanted to pay half the expense of the whole work. In consideration whereof, Middleton, on the 2d of August following, conveyed to him one moiety of the whole undertaking; and on the 24th of the same month delivered to the Lord Treasurer an account of all his disbursements to that time. The shareholders in the New River Water Company being 29 in number were incorporated by the king's letters patent, June 21st, 1619, and though the king was a proprietor of one-half the whole work, Middleton, to prevent the direction of the company's affairs from falling into the hands of courtiers, precluded him from having any share in the management thereof, and only allowed him a person to be present at the several courts and meetings of the company to prevent injustice being done to his Royal principal. Though the water was brought into the basin at Islington in 1618, no dividend was made among the proprietors till 1633, when £11 19s. 1d. was divided upon each share. But the second dividend only amounting to £3 4s. 2d., and the third call being expected, Charles I. proposed to Sir Hugh Middleton that if he would secure to him and his successors a fee-farm rent of £500 per annum out of the profits of the company, clear of reprises, he would reconvey to him all his right and interest in the new river; which Sir Hugh readily accepting, the royal moiety by deed under the great seal, November 18th, 1636, was reconveyed to him; by virtue whereof the king's inspector or overseer ceased to appear at the company's courts or meetings. Sir Hugh was no sooner in possession of the royal moiety than he divided the same into 36 shares, called *king's* shares—answerable to those of the other half called the *adventurers'* shares—which he not only discretionally burdened with the aforesaid fee-farm rent of £500 per annum, but he likewise subjected two of the adventurers' shares to the payment of part of the said annuity.

This company at present affords a larger supply of water to the metropolis than any other of the water companies, and its delivery is confined to the north side of the Thames. This supply is drawn from Ware, in Hertfordshire, assisted extensively by the river Lea, at Hertford, seven ponds at Hampstead, seven at Highgate, four artesian wells sunk at Amwell, Cheshunt, Hampstead Heath, and Hampstead Road, and the old Chadwell spring. It has store and settling reservoirs consisting of the river channel itself, 28 miles long, and about 5 yards wide, which has a capacity of storing about 117 millions of gallons, or about one day's supply for all London; two reservoirs at Cheshunt, which can store about 75½ millions of gallons, and another reservoir at Hornsey, capable of holding 39 millions of gallons; two more at Stoke Newington, constructed in 1833, capable of holding 130 millions of gallons; and the ancient "round pond," the one original reservoir, at the New River head, which contains at least two millions one hundred and sixty-two thousand gallons. This company, which now includes the old London Bridge Water Company, and the Hampstead Water Company, has eight more store reservoirs for filtered water at different parts of its works, capable of storing about 23½ millions of gallons, all of which are covered, except that at Hornsey, which is exempt on account of its distance from town. The company has eleven filtering beds; three at Hornsey, five at Stoke Newington, and three at the New River head, possessing a joint sand area of nine and a half acres, and being capable of storing eleven millions one hundred and sixty-three thousand gallons. The filtering medium is five feet in thickness, two of which consist of sand, and the rest of gravel in layers, increasing in coarseness towards the bottom. It has further storage for water for purposes not requiring filtration in thirteen ponds before alluded to, at Hampstead and Highgate, which hold about 67 millions of gallons, and one reservoir at Camden Square, which holds about 2 millions of gallons. Summed up roughly, this storage amounts to forty-one reservoirs, counting the river channel as one, which have together an area of two hundred and fifteen acres, and holding 467 millions of gallons, or water equal to supply the company's district for eighteen days. There are ten engine stations at different points of the works, having eighteen engines of, all together, about 1,600 horses' power, besides several large water-wheels, which are arranged with the engines to work fifty-one pumps. The daily delivery of water is about 25 millions of gallons for the six days a week supply, (the Sunday supply being less,) which is about 9,000 millions of gallons annually. The company's town district has an area of about seventeen square miles; one hundred and eight thousand houses are supplied; and the highest point to which the water is sent is at Hampstead, four hundred and fifty-four feet above Trinity high-water mark. The distribution of this water is made by about six hundred miles of cast iron pipes, varying from four feet to three inches in diameter; and the tenants' communication lead pipes, which branch out from the mains, have a joint length of at least fifteen hundred miles. There are about four thousand five hundred sluice cocks of from three inches to four feet in diameter, and eleven thousand fire-plugs. The capital of this enterprise is now nearly two and a half millions sterling.

The next company of importance on the north side of the Thames, to the New River Company, is the

EAST LONDON WATER-WORKS.

This Company was established in 1807, at Old Ford. It represents a capital of one million sterling. It supplies 80,000 houses with about seventeen millions of gallons of water. Its source of supply is the river Lea, above Tottenham, and its total length of mains and branches may be estimated at about 380 miles.

THE WEST MIDDLESEX WATER-WORKS,

Situated on the north side of the river, comes next in importance. The company was established in 1806, and their source of supply is now the Thames, near Hampton, in Middlesex. The capital is about £700,000. They supply 30,952 houses with about seven and a half millions of gallons daily. The total length of mains and branches for the distribution of the water is 204 miles.

THE CHELSEA WATER-WORKS,

On the north side of the Thames, commenced in 1724. They supply 27,000 houses with about eight and a half millions of gallons of water daily. The source of the supply is at Seething, near Thames Ditton; the mains and branches are estimated at about 200 miles. The present capital is nearly one million sterling.

THE GRAND JUNCTION WATER-WORKS,

Making the fifth on the north side of the Thames, were begun 1798. The source of supply, which was originally the Grand Junction Canal, which drew its waters from the rivers Colne and Brent, is now the Thames, at Hampton. It distributes about seven and a half millions of gallons of water daily to about 18,000 houses, and its capital is nearly three-quarters of a million sterling. The length of its main and branches is estimated at 210 miles.

On the south side of the Thames there are three water companies, making, together with the five on the north side, eight companies in all.

THE SOUTHWARK AND VAUXHALL WATER-WORKS,

Commenced in 1822, and supply a district originally satisfied by an ancient pond at St. Mary Overy, Southwark. The source of supply is the river Thames, at Hampton. They furnish ten and a half millions of gallons of water daily to about 42,000 houses. The capital is about £650,000, and the mains and branches are estimated at 565 miles.

THE LAMBETH WATER-WORKS,

Commenced in 1785. The capital is now about £680,000. The supply is to 33,000 houses, and is about seven millions of gallons of water daily, taken from the Thames between Kingston and Thames Ditton. The total length of the mains and branches is 260 miles.

THE KENT WATER-WORKS

Are at Deptford, and commenced in 1699, and they now include the Plumstead Company. Until lately the source of supply was the river Ravensbourne, but they now draw the water from artesian wells. The capital is £310,000 sterling. They supply 26,000 houses, with four and a half millions of gallons daily. The mains and branches are 167 miles in length.

Mr. Hollingshead observes that these figures and details, which he has taken great pains to collect from the companies themselves, show that the present water supply of London, by the eight existing water-works, is about eighty-eight millions of gallons daily, sent through about two thousand five hundred and thirty miles of underground main pipes, all changed from wood to iron since 1810. This supply, which consumes a lake every day of sixty acres, six feet deep, flows into some three hundred and sixty-eight thousand houses and tenements,* through about six thousand miles of lead pipe; and the whole present capital of the water companies is seven millions six hundred and forty thousand pounds. Such a supply of water gives a daily average, to each member of our metropolitan population, of about thirty-one gallons—although no one really uses more than six gallons a day—at an average cost of about five per cent. on the house rental.—*Sanitary Reporter.*

* *Daily* means six days a week. The Sunday supply being much less than that of other days.

ILLUMINATING POWER OF LONDON GAS.—In Dr. J. Northcote Vinen's report, on the gas supplied by the Surrey Consumers Company, for the fortnight ending June 27th, the average illuminating power of the gas was found to be 13.44 candles. Ammonia was present at every examination.

Dr. Hillier, in his report for the month of June, states that the gas supplied by the Imperial Company in St. Pancras, was, on an average, equal to 14.8 candles—the highest result being 15.1 candles. Plenty of ammonia was present in this gas also.

CHICAGO, ILL.—In the city of Chicago there are 772 streets, stretching a distanre of 406 miles. There are 105 miles of water-mains laid, of gas-mains there are 48 miles laid, and 1,310 street lamps. The extent of public sewerage is about 60 miles.

COLLIERY EXPLOSIONS IN ENGLAND.—On June 27th an explosion of fire-damp, accompanied with loss of life to several men, and much injury to persons and property, occurred at the Park Colliery, Glamorganshire. The mine in question, which is situated at a place called Baglan, Britonferry, is worked by Messrs. Thomas & Co., and gives employment to about 150 workmen. At the time the explosion took place the greater part of these were above ground.

At Ruabon two men were killed by an explosion of fire-damp, at midnight on July 16th, at the Wynnstay Colliery. They had gone to their work as usual, about 700 yards from the pit's mouth, and before their descent their safety lamps were carefully locked by the man appointed. About 40 persons were at work in other parts of the pit. An explosion was heard, when the managers descended and found the men dead; an accumulation of fire-damp had taken place, and it was manifest that both men had broken open their lamps.

PITTSBURGH, PA.—During the past year—ending June 30—there have been laid in Pittsburgh, one hundred and ten services, increasing the number of services to private consumers, to three thousand one hundred and forty-four. We will publish the report of the Pittsburgh Gas Company in our next issue.

PATENTS.

UNITED STATES.

39,227.—W. H. Gwynne, White Plains, N. Y., for a Process for the Manufacture of Illuminating Gas:

I claim carbonizing hydrogen gas, by passing it through a sufficient quantity of anthracite coal to render it fit for illuminating purposes, substantially as described.

39,233.—John Howard, Salem, Mass., for a Machine for making Cement Pipes:

I claim forming the exterior of the pipe, and holding and sustaining it while being so formed, upon its rod or shaft, by means of two lateral rollers, operating therewith substantially as described.

Also in combination with the two lateral rollers operating upon the pipe as described, I claim the top or third roller, i i, for the purpose specified.

39,237.—Thomas J. Mayall, Roxbury, Mass., for a Hose or Tubing:

I claim forming a hose or tubing, by first saturating or incorporating threads or strands of fibrous materials, rubber or gutta-percha, or compounds of either or both, and then weaving or braiding the same, substantially as set forth.

39,238.—Thomas J. Mayall, Roxbury, Mass., for the Manufacture of Elastic Hose or Tubing:

I claim a hose or tubing, in which the periphery of one or more of its layers is formed by weaving or braiding upon an inner tube or lining an outer tube made of twine, wire, or other strands or threads, substantially as set forth.

39,245.—Stephen Puffer & Andrew J. Sands, 2d, Oxford, N. Y., for a Water Elevator:

We claim the longitudinally sliding, self-detachable crank, H, when arranged and combined with the toothed coupling-wheel, G, of the windlass shaft, C, substantially in the manner and for the purpose herein set forth.

We also claim the self-detachable sliding crank, H, the toothed coupling-wheel, G, the windlass shaft, C, the rigidly united brake, lever, and pawl, L and M, the automatic, self-discharging bucket, N, and the windlass drum, E, of our improved water-drawing apparatus, when said parts are arranged and combined with each other substantially in the manner and for the purpose herein set forth.

39,253.—George F. J. Colburn, Newark, N. J. (assignor to Lemuel Beers, Newtown, Conn.), for a Hinged Collar for Lamps:

I claim, first, A hinged collar, a f, adapted for application between the lamp-top, t, and neck, n, opening to a limited extent to afford direct access to the reservoir below the burner, and held in its open position by the weight of the chimney, all as herein shown and explained.

Second, The combination of the fastening, e, and handle, i, arranged and operating as specified.

39,259.—Birdsill Holly, Lockport, N. Y., for a Pump:

I claim, first, The valve ring or support, B, provided with the ribs, e e, or equivalent, and with one side, f, made lighter than the other, for the purpose of retaining said support in place in the cylinder, substantially as herein set forth.

Second, In combination with the support, B, and its valve, C, I also claim the thin raised valve-seat, d, arranged substantially as described.

Third, I also claim the inclined, inductive valve, C, so formed that when tipped for the admission of the water, its upper surface will assume a horizontal position, or approximately so, substantially as herein set forth.

Fourth. In combination with the induction-valve, C, I also claim the eduction-valve, E, provided with a stem, r, and the piston, D, arranged and operating substantially as specified.

Fifth, I also claim the arrangement and combination of the piston, D, composed principally of the parts, i k, the valve, E, the piston-rod, G, and nut, P, substantially as and for the purposes herein set forth.

39,266.—David Alcorn, New York city, for a Dry Gas-Meter:

I claim, first, Making the port openings of the valve-seat, C, substantially in the enlarged and curved form set forth and described, for the purposes specified.

Second, I claim casting or constructing the valve-seat, C, and its hollow projection or elongation, c6, together in one solid piece, substantially as described and set forth, for the purposes specified.

Third, I also claim arranging the channel, F, in an oblique position in relation to the valve and to the inlet tube, E, as described and set forth, for the purposes specified.

39,271.—John S. Brooks, Rochester, N. Y., for a Filter and Cooler:

I claim a combined filter and cooler, having two separate reservoirs for the filtered water, substantially as shown, and for the purposes specified.

I also claim, in combination with the two reservoirs, the pipe, D, serving as a supply to the upper reservoir, and as a passage for air to and from the lower reservoir, as and for the purposes shown and specified.

39,301.—Henry W. Millar, Utica, N. Y., for a Chimney for Lamps:

I claim, as an improved article of manufacture, a lamp-chimney, constructed of glass and mica, in the manner substantially as herein shown and described.

39,302.—Joseph J. Miner, Buffalo, N. Y., for a Signal Lantern:

I claim the opaque shade, D, made movable, so that it may be raised or lowered as desired (with or without the reflector, E), in combination with transparent colored shades, for the purposes and substantially as set forth.

39,320.—J. J. Marcy, (assignor to Edward Miller), Meriden, Conn., for a Lamp Burner:

I claim the combination with the hinge, C, of the rigid curved rod, F, fixed to the cone, H, projecting downward through the shell, A, between the hinge and the wick-tube, and provided with a bent end, b, which, coming in contact with the under side of the said shell, operates by a tensional strain upon the rod, F, to limit the turning of the chimney, all as herein described.

PATENT AGENCIES.

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The second part is approaching completion and will shortly be announced.

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PROPOSALS.

PROPOSALS FOR CONSTRUCTING A BRICK TUNNEL UNDER LAKE MICHIGAN, TWO MILES LONG, FOR THE CITY OF CHICAGO.

OFFICE OF THE BOARD OF PUBLIC WORKS, CHICAGO, August 13th, 1863.

Sealed proposals will be received at this office till Wednesday, September 9th, at 11 o'clock, A. M., at which time the Board will open the same, for doing all the work and furnishing all the materials required for the construction of a brick tunnel, five feet clear diameter, and extending from the present pumping works of the city, two miles out, under the bed of Lake Michigan, and through what numerous borings invariably show to be a stiff blue clay soil, together with land and lake shafts, and protecting cribs, in accordance with the plans and specifications for the doing of said work, to be found on file in the office of this Board on and after the 19th inst.

The Board would prefer to let the entire work to one contractor or company, but will receive separate proposals for the tunnel proper and land shaft, for the protecting cribs, and for the cast iron cylinders for lake shafts.

The Board reserves the right to reject any or all bids, and to accept any one bid complying with the conditions of this advertisement.

The bids must be sealed, and must be accompanied with a bond of the penal amount of $200, blanks for which will accompany the specifications, guaranteeing the execution of a contract in accordance with the bid, in case the bid is accepted.

Proposals must be directed to the Board of Public Works, and indorsed "Proposals for Lake Tunnel."

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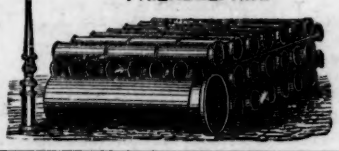

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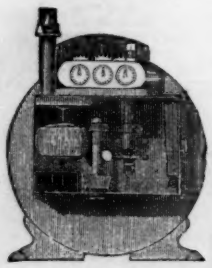

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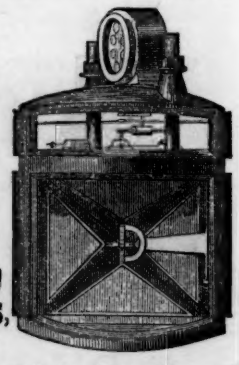

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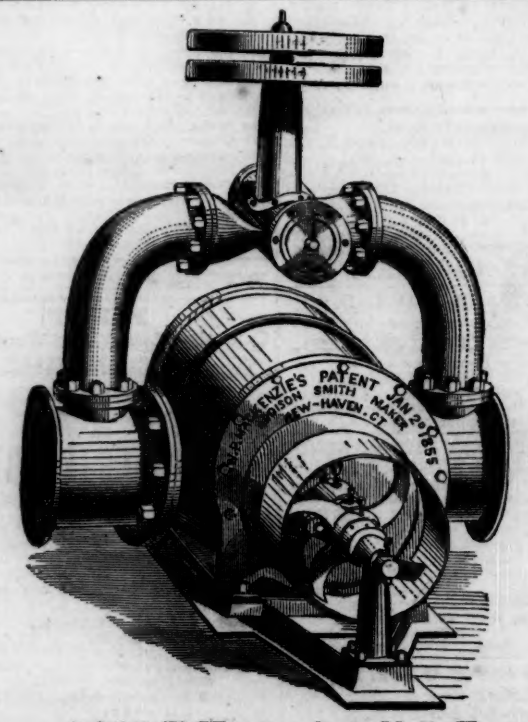

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